Separation of Technetium from Nuclear Waste Stream Simulants

A Report by

Professor Steven H. Strauss, Principal Investigator
Department of Chemistry, Colorado State University
Fort Collins, CO 80523

Final Report

Contract 669HH0013-9Z

Los Alamos National Laboratory

September 30, 1994

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ABSTRACT

Members of the Strauss research group at Colorado State University acquired equipment and instrumentation necessary to carry out this project, including a Perkin-Elmer P-400 ICP-AES spectrometer. All members of the research team were trained in the proper protocols, procedures, and safeguards necessary to carry out this project. We evaluated several colorimetric assays for ReO_4^- , and discovered that all were flawed. We evaluated atomic absorption spectroscopy as a technique to determine sub-millimolar concentrations of ReO_4^- , and discovered that it is not sensitive enough for our use. However, we discovered that ICP-AES can be used to determine concentrations of ReO_4^- down to 0.25 ppm. We next determined that ReO_4^- can be quickly extracted (10 minutes or less) from aqueous HNO_3 using the commercial extractant Aliquat-336 nitrate diluted with 1,3-diisopropylbenzene. Higher concentrations of extractant led to higher values of K_d (the distribution ratio). K_d was lower as the nitrate concentration of the medium increased, and was also lowered by increasing the acidity at constant nitrate ion concentration. We performed parallel studies with TcO_4^- , determining that $K_d(\text{ReO}_4^-)$ and $K_d(\text{TcO}_4^-)$ track similarly as the conditions are changed. A considerable effort was made to prepare substituted pyridium nitrate salts that are soluble in organic solvents so that these could be used as alternate extractants. Over twelve different compounds were made and purified. However, in all cases but one, the salts were also soluble to some extent in the aqueous phase, significantly limiting their usefulness as extractants for our purposes. Many of the new extractant salts would partition between the organic solvent and water so that 10% of the extractant salt was in the aqueous phase. Only 1-methyl-3,5-didodecylpyridium nitrate (prepared from a sample of the chloride salt, which was prepared by Professor Richard Bartsch's group at Texas Tech University) did not show any measurable solubility in water. However, this compound was not as good an extractant as Aliquat-336. A considerable effort was also made to find suitable alternative solvents to 1,3-diisopropylbenzene. Several ketone solvents with flash points above 60°C were tested, and two of these, 2-nonanone and 3-nonanone, were superior to 1,3-diisopropylbenzene as a diluent (i.e., significantly higher K_d values were observed).

STATEMENT OF WORK

(written October 1993; updated July 1994)

Separation of Technetium from Nuclear Waste Stream Simulants

INTRODUCTION

Approximately 5,600 kg of technetium (Tc) are present in the Hanford waste tanks, primarily as pertechnetate (TcO_4^-), which is a very mobile species in the environment. This characteristic, along with its long half-life (^{99}Tc , $t_{1/2} = 213,000$ a) makes technetium a major contributor to the long-term hazard associated with Hanford's low level waste (LLW) form, grout. For a variety of reasons, current grout technologies are incompatible with the presence of technetium. Instead, the *separation of technetium* from the LLW stream and *then vitrifying it* along with the high level waste components is the best alternative. In the near term, Initial Pretreatment Modules (IPMs) will be required to treat waste streams in order to mitigate safety concerns and to generate tank capacity. Since the IPM effluent is destined for the grout plant, complex pretreatment processes such as the "Clean Option" will require technetium separation from both acidic and caustic waste streams. A leading candidate technology for separating technetium is *liquid phase solvent extraction*. This Statement of Work details the research that the Strauss research group in the chemistry department of Colorado State University (CSU) will carry out to evaluate, develop, and improve this technology.

REQUESTED RESEARCH

The Strauss research group in the chemistry department of CSU will investigate the solvent extraction behavior of salts of the perrhenate (ReO_4^-) ion, a stable (non-radioactive) chemical surrogate for pertechnetate. These two tetrahedral anions have very similar sizes and potentials.

$$r(\text{Tc}-\text{O}) = 1.711(3) \text{ \AA}$$

$$\text{TcO}_4^-/\text{TcO}_2 \ E^\circ = 0.74 \text{ V}$$

$$K_a = 1.1 \ (\mu = 5)$$

$$\text{Sol. (K}^+, \text{H}_2\text{O, 25}^\circ\text{C)} = 0.11 \text{ molal}$$

$$r(\text{Re}-\text{O}) = 1.719(5) \text{ \AA}$$

$$\text{ReO}_4^-/\text{ReO}_2 \ E^\circ = 0.51 \text{ V}$$

$$K_a = 0.52 \ (\mu = 5)$$

$$\text{Sol. (K}^+, \text{H}_2\text{O, 25}^\circ\text{C)} = 0.11 \text{ molal}$$

Commercially available anion extractants, including Aliquat-336®, will be used along with commercially available technical grade solvents, including *meta*-diisopropylbenzene. The concentrations of perrhenate in the aqueous phase will be chosen to simulate the concentrations of pertechnetate in known waste streams. As the work progresses, known co-contaminants will be added to the aqueous phase in an effort to closely simulate the composition of known waste streams. The exact nature of these results cannot be anticipated. The investigators will be in weekly communication with Drs. Kent Abney and Norman Schroeder as well as other LANL staff. In this way, the CSU investigators will learn about the evolving needs of the Hanford Waste Tank Remediation project, and therefore the lines of experimentation at Colorado State will drift in the direction of LANL and DOE programmatic needs.

The project will be broken down into the following distinct phases. **Phase 1.** Professor Strauss, the principal investigator, will complete an up-to-date literature search and review on solvent extraction methodologies (from both aqueous and non-aqueous media) for pertechnetate and perrhenate. The goal will be to identify promising anion extractants that might be tested, even if these are not commercially available. The P.I. will purchase and install the required equipment and supplies and will train the personnel (the graduate students and the postdoc). The team of investigators will complete an assessment of analytical techniques for the quantitative determination of sub-millimolar concentrations of ReO_4^- in both aqueous and non-aqueous media. The analytical techniques evaluated will include atomic absorption spectroscopy, inductively coupled plasma atomic emission spectroscopy, UV-VIS (electronic) spectrophotometry, and mass spectrometry. This phase of the project will be *completed* by the end of the first three months of the sub-contract.

Phase 2. The research team will complete a study of the extraction of ReO_4^- from acid solution and/or basic solution using Aliquat 336 as the anion extractant and *meta*-diisopropylbenzene as the non-aqueous solvent. The parameters chosen will parallel those used in a similar study of TcO_4^- extraction carried out by Dr. Norman Schroeder in INC-12. As the apparent necessity warrants and as time permits, this line of investigation will include the behavior of $[\text{OH}^-]$, $[\text{NO}_3^-]$, $[\text{NO}_2^-]$, $[\text{HCO}_3^-]$ with the chloride and nitrate forms of Aliquat-336. The quantitative data of interest are the values of the distribution coefficients (K_d) and the solubility of the anion extractant in the aqueous phase. These data will allow a determination to be made regarding the efficacy of perrhenate as a stable (non-radioactive) surrogate for pertechnetate as far as proven solvent extraction methodologies are concerned. This phase of the project will be *completed* by the end of the first six months.

Phase 3. The research team will begin a study of alternate non-aqueous solvents and alternate anion extractants. The emphasis will be on solvents that are not aromatic hydrocarbons, not chlorinated hydrocarbons, and that have flash points greater than 60°C. As far as anion extractants are concerned, some will be purchased from commercial sources, some will be supplied by scientists at LANL, and some will be synthesized in our laboratory. Our goal will be to improve the current extraction system involving Aliquat-336 and *meta*-diisopropylbenzene by at least a factor of 10 in K_d without sacrificing selectivity for TcO_4^- from other fission products and without creating a new waste stream that is environmentally problematic. Variables will include temperature, contact time, pH, $[NO_3^-]$, $[NO_2^-]$, and $[HCO_3^-]$. This phase of the project will be *started* before the end of the first nine months. It is open ended, since the number of new extraction systems is not limited, and for this reason this phase may not be "complete" by the end of the sub-contract.

Phase 4. The research team will begin a study of alternatives to re-extraction of ReO_4^- into aqueous acid for concentration, removal, and storage. The goal is to develop one or more methodologies that will allow ReO_4^- (and ultimately TcO_4^-) to be isolated in concentrated form directly from the non-aqueous solvent. This would eliminate the production of a high-volume waste stream (currently 8M nitric acid) and could conceivably lead to the recycling of the anion extractant. Several possible methods, including chemical precipitation, chemical reduction, and electrochemical reduction (with precipitation) will be explored. This phase of the project will be *started* before the end of the first twelve months and, if fruitful, could possibly become an ongoing project, since this is a very important aspect of the DOE's technetium waste problem.

The four phases of proposed experiments above are very ambitious. It is given as an indication of the direction that the research will take. It is anticipated that some of the activities will not be able to be explored as completely as others. Furthermore, as the project proceeds, and as the Strauss group communicates with the Los Alamos group, some of the proposed experiments might lose their urgency. However, the identification, evaluation, and development of alternative solvent extraction methodologies for perrhenate (pertechnetate) will remain the primary objective.

In addition to supplying the Strauss research group with new anion extractants, the INC-12 group at LANL will supply a Macintosh Centris 650 8/230 computer, including the latest versions of the software Word, Excel, Kalaidagraph, and Chemdraw Plus, that will be used for data collection, graphical analysis of data, literature searching (a modem pool exists via the chemistry department network), figure preparation, and report and manuscript preparation. This computer

will remain in Professor Strauss' lab at Colorado State University for the duration of the sub-contract. A printer is not required, since one is available to the Strauss group at CSU.

RESULTS

The exact nature of the results of the experiments outlined above cannot be anticipated. Hence, the expectations will be nothing more than the results of the experiments. The abilities and judgement of the investigators will be relied on to develop the most fruitful lines of experimentation.

DELIVERABLES

1. A report on Phase 1 of the project will be submitted to LANL by June 1, 1994.
2. A report on Phase 2 of the project will be submitted to LANL by July 1, 1994.
3. A report on Phase 3 of the project will be submitted to LANL by Sept. 1, 1994.
4. A final report on the project will be submitted to LANL by Sept. 30, 1994.

SECTION I — LITERATURE REVIEW

We have reviewed the literature related to this project, especially with respect to the extraction of TcO_4^- and ReO_4^- from aqueous solution using organic extractants and solvents. The database CAS Online was searched during July 1993 and April 1994. Our review appears in this Milestone as a 35-page appendix starting on page 16.

SECTION II — EQUIPMENT INSTALLATION AND PERSONNEL TRAINING

During the first phase of the project, major equipment, glassware, and supplies were purchased and installed in Professor Strauss' laboratory. The equipment included a Perkin-Elmer P-400 inductively-coupled-plasma atomic emission spectrometer (ICP-AES), a Büchi rotary evaporator, a Barnstead Nanopure water purifier, an Orion pH meter, a LabLine microprocessor shaker bath, a Macintosh Quadra 650 computer, and a vacuum system for the synthesis of new extractants.

The personnel who have worked on this project all have degrees in chemistry. They are:

- Professor Steven H. Strauss, P.I., Ph.D. 1979, Northwestern University
- Dr. M. Dawn Van Seggen, Ph.D. 1994, Colorado State University
- Ms. Carmen I. Butoi, A.B. 1993, Franklin and Marshall College
- Ms. Jennifer Clark, B.S. 1993, University of Colorado at Boulder
- Ms. Kristina M. Rohal, B.S. 1993, Bethany College
- Mr. Jeffrey J. Rack, B.S. 1990, Clemson University
- Mr. Tom Barbarich, B.S. 1991, Wayne State University
- Mr. Juston Rockwell, B.S. 1991, Fort Lewis College

SECTION III — QUANTITATIVE DETERMINATION OF ReO_4^-

During the summer of 1993 (before the contract began), Professor Strauss and Ms. Butoi evaluated several colorimetric (spectrophotometric) assays for ReO_4^- , most notably those involving simultaneous reduction of rhenium and complex formation with thiocyanate anion. The major references for these assays are given below:

- Wahi, A.; Kakkar, L. R. "Ascorbic acid as a new reductant in the thiocyanate method for the spectrophotometric determination of rhenium," *Fresenius J. Anal. Chem.* **1992**, 343, 904
- Mishra, N.; Sinha, S. K.; Patel, K. S.; Mishra, R. K. "Extraction and Spectrophotometric Determination of Rhenium(VII) with Thiocyanate and Amides," *Bull. Chem. Soc. Japan* **1989**, 62, 3400.
- Sharma, I.; Chakraborty, A. K. "Extraction and Spectrophotometric Determination of Rhenium with Thiocyanate and Hydroxamic Acids," *Indian J. Chem.* **1988**, 27A, 271.
- Yatirajam, V.; Khaira, S.; Kakkar, L. R. "An Improved Thiocyanate Method for the Determination of Rhenium," *Indian J. Chem.* **1986**, 25A, 879.
- Trop, H. S.; Davison, A.; Jones, A. G.; Davis, M. A.; Szalda, D. J.; Lippard, S. J. "Synthesis and Physical Properties of Hexakis(isothiocyanato)technetate(III) and -(IV) Complexes. Structure of the $[\text{Tc}(\text{NCS})_6]^{3-}$ Ion," *Inorg. Chem.* **1980**, 19, 1105.
- Mitra, M.; Mitra, B. K. "Liquid-Liquid Extraction of a Rhenium-Thiocyanate Complex with Hexamethylphosphoramide and Direct Spectrophotometric Determination in the Organic Phase," *Talanta* **1978**, 25, 597.
- Savariar, C. P.; Hariharan, T. R. "Solvent Extraction and Spectrophotometric Determination of Rhenium(VII) using Mixed Ligands," *J. Indian Chem. Soc.* **1978**, 55, 349.
- Neas, R. E.; Guyon, J. C. "Spectrophotometric Determination of Thiocyanate with Rhenium," *Anal. Chem.* **1969**, 41, 1470.
- Fujinaga, T.; Koyama, M.; Kanchiku, Y.; Tsurubo, S. "Solvent Extraction and Spectrophotometric Determination of the Pertechnetate Ion with Methyl Violet," *Bull. Chem. Soc. Japan* **1967**, 40, 817.

We determined that none of the prescribed methods gave reproducible and precise results. All methods were flawed, primarily due to incomplete conversion of all of the rhenium present to a single species with a known extinction coefficient. No further attempts were made to improve the spectrophotometric procedures.

We evaluated atomic absorption (AA) spectroscopy as a technique to determine sub-millimolar concentrations of ReO_4^- . Rhenium cannot be determined using graphite furnace AA, which is normally one to two orders of magnitude more sensitive than standard AA, because it forms a refractory carbide. We prepared samples and traveled to the Perkin-Elmer facility in Denver, CO, where, with the help of a member of their technical staff, we determined that the lowest concentration of rhenium (in the form of ReO_4^-) that we could reproducibly and precisely measure was approx. 100 ppm (1 mM ReO_4^- = 1,800 ppm rhenium). Since we expect to develop superior extractants in the course of this project that could lead to residual concentrations of ReO_4^- below 1 ppm in the raffinate, we decided that AA spectroscopy was not suitable for this project.

We evaluated ICP-AES on another occasion, also with the help of the Perkin-Elmer technical staff. Reproducible and precise data were obtained for concentrations of rhenium (in the form of ReO_4^-) down to 0.25 ppm. On the basis of this evaluation, we purchased a used (one-year old) ICP atomic emission spectrometer from Perkin-Elmer in November 1993. Along with the two sections above, this completed Phase 1 of the project.

SECTION IV — EXTRACTION OF ReO_4^- USING ALIQUAT-336

During the next phase of the project, we studied the extraction of a 1.00 mM solution of KReO_4 in 5.00 M nitric acid using the commercial extractant Aliquat-336 nitrate (purchased from Aldrich Chemical Co.) dissolved in 1,3-diisopropylbenzene (DIPB; 96%, also purchased from Aldrich). The extractant is a viscous liquid. The sample purchased contained a small amount of a light colored precipitate. Solutions of the extractant in DIPB also contained a small amount of precipitate. Aldrich has informed us that they are discontinuing Aliquat-336 salts because of the formation of the precipitate, which they have not characterized. Another supplier will have to be found, and the formation of the precipitate remains a problem.

Standard samples of KReO_4 in 5.00 M nitric acid were prepared and were used to create ICP-AES calibration curves. Two such curves, created using freshly prepared perrhenate samples on two consecutive days, are shown on the next two pages (Figures 1-2). The agreement from day to day is more than adequate for the concentration range chosen (0-1 mM ReO_4^-). We have determined that standard samples of KReO_4 in nitric acid are stable for many weeks. Nevertheless, we plan to prepare fresh calibration standards on a regular basis.

[ReO₄]⁻ Calibration Curve, 5 M HNO₃

Figure 1. ICP Intensity vs. [ReO₄]⁻ (i.e., a calibration curve) for extraction of ReO₄⁻ from aqueous 5M HNO₃ into diisopropylbenzene containing 0.2 M Aliquat-336 nitrate

Figure 2. ICP Intensity vs. [ReO₄]⁻ (i.e., another calibration curve) for extraction of ReO₄ from aqueous 5M HNO₃ into diisopropylbenzene containing 0.2 M Aliquat-336 nitrate

In a typical extraction experiment, 20 mL of aqueous perrhenate solution was mixed with 20 mL of an Aliquat-336 nitrate/DIPB solution and shaken for a prescribed amount of time at 20°C. The phases were separated using separatory funnels and the aqueous raffinate was collected in vials for immediate analysis on the ICP-AES. We found that a third phase was present in all experiments. The top phase was nearly colorless and is presumably mostly DIPB. The middle phase was yellow (neat Aliquat-336 nitrate is yellow), and is presumably a concentrated solution of the extractant in DIPB. The bottom phase was colorless and is presumably the aqueous raffinate. The volume of the middle phase increased as the concentration of extractant in DIPB increased from 0.100 M to 0.840 M. In a report that we received from Dr. Norm Schroeder last year, a plot of $\text{TcO}_4^- K_d$ vs. concentration of nitric acid showed that a third phase was present when the acid concentration was 7.5 M and 10.0 M but not at 5.0 M. We have not yet used 1-butanol as a modifier, to eliminate the third phase, in our experiments.

We found that the extractions were complete within 10 minutes: there was no difference in the residual concentration of ReO_4^- after 10, 20, 40, and 106 minutes of shaking at 20°C. Therefore, 20 minutes has been chosen for the shaking time in all subsequent experiments.

The distribution ratio (K_d) is defined as the concentration of ReO_4^- in the organic phase(s) (the extract) divided by the concentration of ReO_4^- remaining in the aqueous phase (the raffinate). Since we have directly determined only the latter concentration, K_d values were calculated as follows ($[\text{ReO}_4^-]_f$ is the final concentration of perrhenate remaining in the raffinate after the extraction is complete):

$$K_d = (1 - [\text{ReO}_4^-]_f) / [\text{ReO}_4^-]_f$$

For 0.200 M Aliquat-336 nitrate in DIPB, we found K_d to be 0.55 when the ratio of organic:aqueous volumes was 1:1 and 0.68 when the ratio of volumes was 2:1. In principal, the K_d values should not depend on the volumes chosen if the two phases are immiscible. Our values are lower than the K_d of ~1.8 for TcO_4^- measured under the same conditions by Dr. Norm Schroeder last year at LANL.

As expected, we found that K_d increased when the concentration of extractant was increased (for a constant ratio of volumes). The lowest K_d , 0.12, was measured when the

concentration of the extractant in DIPB was 0.100 M. The highest K_d , 4.0, was measured when the extractant concentration was 0.840 M. These data are displayed in two different ways in graphs shown below and on the next page (Figures 3-4).

[ReO₄]⁻ Conc. (final) vs. Aliquat-336 Conc.

5 M HNO₃, 1 mM initial [ReO₄]⁻

Figure 3. Final aqueous concentration of ReO₄⁻ vs. concentration of Aliquat-336.

Figure 4. Distribution ratio ($K_d(\text{ReO}_4^-)$) vs. concentration of Aliquat-336.

SECTION V — FURTHER STUDIES ON THE EXTRACTION OF ReO_4^-

During phase one of this project, we determined that inductively-coupled-plasma atomic emission spectroscopy (ICP-AES) is the optimal technique for determining sub-millimolar concentrations of ReO_4^- in aqueous solution. We began our study of the extraction of ReO_4^- from nitric acid into 1,3-diisopropylbenzene containing 0.2 M of the commercial extractant Aliquat-336® nitrate (methyltricaprylammonium nitrate). During phase two of this project, we continued to study the extraction of ReO_4^- from various concentrations of nitric acid and from a number of other aqueous "waste stream simulants."

The following experimental procedure was used. Twenty mL of aqueous perrhenate solution (1.0, 5.0, or 10.0 mM KReO_4 , depending on the preliminary K_d value determined in screening experiments) was mixed with 20 mL of a 0.2 M Aliquat-336® nitrate (methyltricaprylammonium nitrate) solution in diisopropylbenzene (pure 1,3 isomer or technical grade, which contains 96% of the 1,3 isomer) and shaken for 20 min. at 20°C. The phases were separated using separatory funnels (10 min.) and the aqueous raffinate was collected in either glass or polyethylene vials for analysis on the ICP-AES (Perkin Elmer P400). The distribution ratio (K_d) is defined as the concentration of ReO_4^- in the organic phase(s) (the extract) divided by the concentration of ReO_4^- remaining in the aqueous phase (the raffinate). Since we have directly determined only the latter concentration, K_d values were calculated as follows ($[\text{ReO}_4^-]_i$ is the initial concentration of perrhenate in the aqueous layer and $[\text{ReO}_4^-]_f$ is the final concentration of perrhenate remaining in the aqueous layer (the raffinate) after the extraction is complete):

$$K_d = ([\text{ReO}_4^-]_i - [\text{ReO}_4^-]_f) / [\text{ReO}_4^-]_f$$

Our results are summarized in Table I, below. Some of the results are displayed graphically in Figures 5-7, below. The value of K_d drops by a factor of 29 between 0 M and 1 M HNO_3 and continues to drop by a factor of 100 between 1 M and 5 M HNO_3 (see Figure 1). This is undoubtedly due in large part to competition between ReO_4^- and NO_3^- for the extractant cation, methyltricaprylammonium ion, in the organic phase. The $\text{CH}_3\text{NR}_3^+/\text{ReO}_4^-$ ion pair in diisopropylbenzene is clearly more stable than the $\text{CH}_3\text{NR}_3^+/\text{NO}_3^-$ ion pair in this solvent. At 1 M aqueous HNO_3 and 1 mM aqueous KReO_4 , the starting aqueous concentration ratio $[\text{NO}_3^-]/[\text{ReO}_4^-]$ was 1,000 yet 98% of the perrhenate ion present was in the organic phase at the end of the extraction. At 5 M aqueous HNO_3 , only 35% of the perrhenate ions transferred from the aqueous phase to the organic phase.

The hydrogen ion concentration, $[\text{H}_3\text{O}^+]$, has a minor effect on K_d when the aqueous concentration of nitrate ion is kept constant at 3 M (see Figure 2). Increasing $[\text{H}_3\text{O}^+]$ from 10^{-7} M

Table I. Extraction of ReO_4^- from Aqueous Waste Stream Simulants^a

aqueous phase	K_d
18.3 Mohm water	1.4×10^3
1 M HNO_3	49
1 M HNO_3	28 ^b
2 M HNO_3	13
3 M HNO_3	4.3
4 M HNO_3	0.84
5 M HNO_3	0.55
2 M HNO_3 /1 M NaNO_3	6.1
1 M HNO_3 /2 M NaNO_3	11
3 M NaNO_3	27
0.5 M NaOH	2.8×10^3
1 M NaOH	3.1×10^3
2 M NaOH	3.4×10^3
3 M NaOH	4.3×10^3
4 M NaOH	4.5×10^3
5 M NaOH	6.1×10^3
1 M NaOH /1.5 M NaNO_3	87 ^c
1 M NaOH /1.5 M NaNO_3	29 ^b
1 M NaOH /1.5 M NaNO_2	3.3×10^2
1 M NaOH /1.5 M NaNO_3 /1.5 M NaNO_2	76

^a The organic phase was diisopropylbenzene containing 0.2 M Aliquat-336[®] nitrate unless otherwise noted. ^b The organic phase was 7.0% w/w 1-octanol in diisopropylbenzene containing 0.2 M Aliquat-336[®] nitrate. ^c To within experimental error, the same value ($K_d = 88$) was obtained when the Aliquat-336[®] solution was pretreated by shaking with 1 M NaOH for 24 h.

Figure 5. Plots of K_d vs. $[\text{HNO}_3]$, using two different ordinate scales, for extraction of ReO_4^- from aqueous HNO_3 into diisopropylbenzene containing 0.2 M Aliquat-336 nitrate

Figure 6. K_d vs. $[\text{HNO}_3]$ for extraction of ReO_4^- from aqueous mixtures of HNO_3 and NaNO_3 containing a constant 3 M concentration of NO_3^- into diisopropylbenzene containing 0.2 M Aliquat-336 nitrate

Figure 7. K_d vs. $[NaOH]$ for extraction of ReO_4^- from aqueous NaOH into diisopropylbenzene containing 0.2 M Aliquat-336 nitrate

(0 M HNO₃) to 3 M caused K_d to decrease from 27 to 4.3. This may be due to changes in the relative amounts of anionic ReO_4^- and neutral HReO_4 as $[\text{H}_3\text{O}^+]$ increases.¹

The value of K_d increases steadily as $[\text{OH}^-]$ increases (see Figure 7). A maximum value of $K_d = 6.1 \times 10^3$ was obtained when $[\text{OH}^-] = 5 \text{ M}$. However, the presence of nitrate ion decreased K_d dramatically. When the aqueous solution was simply 1 M NaOH, K_d was 2.8×10^3 . When 1.5 M NaNO₃ was also present, K_d was 87. When 1.5 M NaNO₂ was also present, the combination of OH^- , NO_3^- , and NO_2^- lowered K_d to 76. This last result indicates that nitrite ion does not affect K_d significantly when nitrate ion is already present. For an aqueous solution consisting of 1.0 M NaOH and 1.5 M NaNO₂, K_d was 3.3×10^2 .

SECTION VI — EXTRACTION OF TcO_4^-

Professor Strauss and Dr. Van Seggen spent two months in the CST-12 group at LANL (June and July, 1994). During this time, we studied the extraction of TcO_4^- from a variety of aqueous "waste stream simulants."

The following experimental procedure was used. A sample of either 2.5 or 3.0 mL of aqueous pertechnetate solution ($1.5 \times 10^{-5} \text{ M } ^{99}\text{TcO}_4^-$, $\sim 10^{-8} \text{ M } ^{95\text{m}}\text{TcO}_4^-$) was mixed in a thin glass tube with an equal volume of an organic phase containing 0.1 M or 0.2 M extractant and shaken for at least 2 min. at 20°C. The phases were separated by centrifugation (5 min. at 5,000 rpm) and either 1.0 or 1.5 mL of each phase was transferred to a thin plastic tube. The tubes were placed in a gamma ray counting instrument with a NaI(Tl) scintillation detection system (Packard Auto-Gamma® 5530). The number of counts-per-minute (CPM) for each sample and for several blanks (background, BKG) were recorded.

Technetium-95m ($I = +1/2$) decays with a half-life of 61 days by isomeric transition (4%), positron emission (0.4%) and electron capture with gamma emission (>95%).² Seventy percent of all decay events produce a gamma photon of energy 0.2042 MeV.² These are the photons that are counted (the lower and upper limits of photon energies counted by the instrument were set as 0.165 and 0.245 MeV, respectively).

The distribution ratio (K_d) is defined as the concentration of TcO_4^- in the organic phase (the extract) divided by the concentration of TcO_4^- remaining in the aqueous phase (the raffinate). K_d values were calculated as follows (the subscripts *o* and *a* refer to organic and aqueous phases, respectively):

$$K_d = (\text{CPM}_o - \text{BKG}) / (\text{CPM}_a - \text{BKG})$$

Our results are summarized in Table II, below. As the concentration of nitric acid in the aqueous phase increased from 1 M to 8 M, K_d decreased by a factor of 100, from 41 to 0.40. A comparison of Aliquat-336 nitrate with the new extractant DDP^+Cl^- (DDP^+ = 3,5-didodecylpyridinium ion) showed the Aliquat salt to be the better extractant in 7.0% w/w 1-octanol in diisopropylbenzene: K_d for 0.2 M Aliquat-336 nitrate was 41 while K_d for ~0.1 M DDP^+Cl^- was 4.9 (DDP^+Cl^- is not very soluble in 7.0% w/w 1-octanol in diisopropylbenzene). Therefore, for equal concentrations of these two extractants, the Aliquat salt would be approximately four times better than DDP^+Cl^- .

A series of extractions were carried out with an aqueous phase consisting of 1.0 M NaOH and 1.5 M $NaNO_3$. The baseline value of K_d for an organic phase consisting of diisopropylbenzene containing 0.2 M Aliquat-336 nitrate was 1.1×10^2 . (This value did not change when the contact (shake) time was changed from 2 minutes to 5 minutes to 24 hours.) When the organic diluent was changed to 7.0% 1-octanol in diisopropylbenzene, K_d decreased to 59. When an analog of 1-octanol, 2-ethyl-1-hexanol, was used as the diluent with 0.1 M Aliquat nitrate, K_d dropped to 4.0. Clearly, these alcohols must be avoided if high values of K_d are required. When 2,6-dimethyl-4-heptanone (diisobutylketone) was used as the diluent with 0.1 and 0.2 M Aliquat nitrate, K_d increased to 2.3×10^2 and 3.7×10^2 , respectively. This is a significant increase, and this solvent warrants further study (see Section IV, below). When neat 2,6-dimethyl-4-heptanone was used as the organic phase (no extractant added), K_d was 20. When the organic phase consisted of diisopropylbenzene containing ~0.1 M DPP^+Cl^- , K_d was less than 10^{-3} . Under these conditions, hydroxide ion is undoubtedly deprotonating the pyridinium ion, and the neutral pyridine does not function as an extractant for TcO_4^- .

A series of extractions were carried out with a varying aqueous phase. Each sample contained 1 M NaOH and all but one sample also contained other co-contaminants. The organic phase was 0.2 M Aliquat-336 nitrate in diisopropylbenzene in all cases. The baseline value of K_d when the aqueous phase was simply 1 M NaOH was 6.2×10^2 . When the aqueous phase also contained 1.5 M $NaNO_3$, K_d decreased to 1.1×10^2 . The presence of 0.14 M K_2CrO_4 in the 1 M NaOH/1.5 M $NaNO_3$ aqueous phase had a negligible effect on K_d . This concentration of chromate ion is ten times that present in Hanford tank 240-AN-106. Apparently, 0.2 M Aliquat-336 nitrate in diisopropylbenzene is not an effective extractant for divalent tetrahedral oxoanions. The presence of 1.5 M $NaNO_2$ in the 1 M NaOH/1.5 M $NaNO_3$ aqueous phase had a modest effect on K_d , lowering it to 96. When the aqueous phase consisted of a simulant of Hanford tank 240-AN-106 nominally containing 1 M NaOH, 1.5 M $NaNO_3$, 0.86 M $NaNO_2$, 0.49 M $NaAl(OH)_4$, 0.39 M Na_2CO_3 , 0.11 M Na_3PO_4 , 0.093 M NaCl, 0.073 M Na_3 (citrate), 0.031 M Na_2SO_4 , and 0.002 M $Ca(NO_3)_2$, the value of K_d was 1.5×10^2 (a small amount of solid was present when this simulant was prepared, so the concentrations of all reagents are listed as nominal).

Table II. Extraction of TcO_4^- from Aqueous Waste Stream Simulants^a

aqueous phase	K_d
1 M HNO_3	41 ^b
1 M HNO_3	4.9 ^c
8 M HNO_3	0.40 ^b
1 M NaOH	6.2×10^2
5 M NaOH	6.9×10^2
1 M $\text{NaOH}/1.5 \text{ M NaNO}_3$	1.1×10^2 ^d
1 M $\text{NaOH}/1.5 \text{ M NaNO}_3$	59 ^b
1 M $\text{NaOH}/1.5 \text{ M NaNO}_3$	2.3×10^2 ^e
1 M $\text{NaOH}/1.5 \text{ M NaNO}_3$	3.7×10^2 ^f
1 M $\text{NaOH}/1.5 \text{ M NaNO}_3$	20 ^g
1 M $\text{NaOH}/1.5 \text{ M NaNO}_3$	4.0 ^h
1 M $\text{NaOH}/1.5 \text{ M NaNO}_3$	$< 1 \times 10^{-3}$ ^c
1 M $\text{NaOH}/1.5 \text{ M NaNO}_3/0.14 \text{ M K}_2\text{CrO}_4$	1.0×10^2
1 M $\text{NaOH}/1.5 \text{ M NaNO}_2$	2.4×10^2
1 M $\text{NaOH}/1.5 \text{ M NaNO}_3/1.5 \text{ M NaNO}_2$	96
DSS Simulant ($[\text{NaOH}] = 0.783 \text{ M}$)	1.4×10^2
DSS Simulant ($[\text{NaOH}] = 1.0 \text{ M}$)	1.5×10^2

^a The organic phase was diisopropylbenzene containing 0.2 M Aliquat-336[®] nitrate unless otherwise noted. ^b The organic phase was 7.0% w/w 1-octanol in diisopropylbenzene containing 0.2 M Aliquat-336[®] nitrate. ^c The organic phase was 7.0% w/w 1-octanol in diisopropylbenzene containing ~0.1M DDP⁺Cl⁻ (DDP⁺ = 3,5-didodecylpyridinium cation). ^d To within experimental error, the same value ($K_d = 1.1 \times 10^2$) was obtained whether the contact (shake) time was 2 min., 5 min., or 24 hours. ^e The organic phase was 2,6-dimethyl-4-heptanone (diisobutylketone) containing 0.1 M Aliquat-336[®] nitrate. ^f The organic phase was 2,6-dimethyl-4-heptanone containing 0.2 M Aliquat-336[®] nitrate. ^g The organic phase was neat 2,6-dimethyl-4-heptanone. ^h The organic phase was 2-ethyl-1-hexanol containing 0.1 M Aliquat-336[®] nitrate.

SECTION VII — POSSIBLE ALTERNATE SOLVENTS

After searching the literature and many chemical catalogs, we decided to focus our attention on the following solvents for use as diluents with Aliquat-336 nitrate and other alternative anion extractants. Volatility, flash point, and low solubility in water were of primary concern. Most, but not all, of these solvents were investigated in the third phase of this project.

Table III. Properties of Alternate Organic Solvents

	mol. formula	b.p. (°C)	F.p. (°C) ^a	density (g cm ⁻³)
2-ethyl-1-hexanol	C ₈ H ₁₈ O	183-186	77	0.833
2,6-dimethyl-4-heptanone	C ₉ H ₁₈ O	169	44	0.808
2-nonanone	C ₉ H ₁₈ O	192 ^b	64	0.832
3-nonanone	C ₉ H ₁₈ O	187-188	67	0.821
5-nonanone	C ₉ H ₁₈ O	186-187	60	0.826
3,3,5,5-tetramethylcyclohexanone	C ₁₀ H ₁₈ O	— ^c	73	0.881
dodecane	C ₁₂ H ₂₆	216	71	0.750
propylene carbonate	C ₄ H ₆ O ₃	240	132	1.189

^a Flash point. ^b At 743 Torr. ^c The boiling point of this compound is not available.

SECTION VIII — FURTHER STUDIES ON THE EXTRACTION OF ReO_4^-

During phase three of this project, we continued to study the extraction of ReO_4^- from nitric acid and from alkaline "waste stream simulants."

The following experimental procedure was used. Twenty mL of aqueous perrhenate solution (1.0, 5.0, or 10.0 mM KReO_4 , depending on the preliminary K_d value determined in screening experiments) was mixed with 20 mL of a 0.2 M Aliquat-336[®] nitrate (methyltricaprylammonium nitrate) solution in diisopropylbenzene (pure 1,3 isomer or technical grade, which contains 96% of the 1,3 isomer) and shaken for 20 min. at 25°C. The phases were separated using separatory funnels (~10 min.) and the aqueous raffinate was collected in either glass or polyethylene vials for analysis on the ICP-AES (Perkin Elmer P400). The distribution ratio (K_d) is defined as the concentration of ReO_4^- in the organic phase(s) (the extract) divided by the concentration of ReO_4^- remaining in the aqueous phase (the raffinate). Since we have directly determined only the latter concentration, K_d values were calculated as follows ($[\text{ReO}_4^-]_i$ is the initial concentration of perrhenate in the aqueous layer and $[\text{ReO}_4^-]_f$ is the final concentration of perrhenate remaining in the aqueous layer (the raffinate) after the extraction is complete):

$$K_d = ([\text{ReO}_4^-]_i - [\text{ReO}_4^-]_f) / [\text{ReO}_4^-]_f$$

Our results are summarized in Table IV, below. Our results clearly show that the aliphatic ketones 2-nonanone (flash point °C) and 3-nonanone (flash point °C) are superior to diisopropylbenzene as diluents. On the other hand, 2-ethyl-1-hexanol is clearly inferior to DIPB. No third phase was observed when the oxygenated solvents were used to extract ReO_4^- from 1 M HNO_3 .

Table IV. Extraction of ReO_4^- from Aqueous Waste Stream Simulants^a

aqueous phase	organic solvent	anion extractant	K_d
1 M HNO_3	DIPB	0.2 M Aliquat-336 ⁺ NO_3^-	49 ^b
1 M HNO_3	DIPB	0.2 M Aliquat-336 ⁺ NO_3^-	28 ^c
1 M HNO_3	2-NON	0.2 M Aliquat-336 ⁺ NO_3^-	56
1 M HNO_3	3-NON	0.2 M Aliquat-336 ⁺ NO_3^-	52
1 M HNO_3	EH	0.2 M Aliquat-336 ⁺ NO_3^-	5.5
1 M $\text{NaOH}/1.5 \text{ M } \text{NaNO}_3$	DIPB	0.2 M Aliquat-336 ⁺ NO_3^-	87
1 M $\text{NaOH}/1.5 \text{ M } \text{NaNO}_3$	2-NON	0.2 M Aliquat-336 ⁺ NO_3^-	1.6×10^2
1 M $\text{NaOH}/1.5 \text{ M } \text{NaNO}_3$	3-NON	0.2 M Aliquat-336 ⁺ NO_3^-	1.8×10^2
1 M $\text{NaOH}/1.5 \text{ M } \text{NaNO}_3$	EH	0.2 M Aliquat-336 ⁺ NO_3^-	5.1

^a Abbreviations: DIPB = diisopropylbenzene; 2-NON = 2-nonanone; 3-NON = 3-nonanone; TMCH = 3,3,5,5-tetramethylcyclohexanone; DMH = 2,6-dimethyl-4-heptanone; EH = 2-ethyl-1-hexanol; Aliquat-336⁺ = methyltricaprylammonium cation; DDP⁺ = 3,5-didodecylpyridinium cation; MDDP⁺ = 1-methyl-3,5-didodecylpyridinium cation. ^b A third layer formed in this experiment. ^c 7.0% w/w 1-octanol was added to the organic phase to avoid third layer formation.

SECTION IX — FURTHER STUDIES ON THE EXTRACTION OF TcO_4^-

During this project, Professor Strauss and Dr. Van Seggen spent two-months in the CST-12 group at LANL (June and July, 1994). During that time, we studied the extraction of TcO_4^- from a variety of aqueous "waste stream simulants."

The following experimental procedure was used. A sample of either 2.5 or 3.0 mL of aqueous pertechnetate solution ($1.5 \times 10^{-5} \text{ M } ^{99}\text{TcO}_4^-$, $\sim 10^{-8} \text{ M } ^{95\text{m}}\text{TcO}_4^-$) was mixed in a thin glass tube with an equal volume of an organic phase containing 0.1 M or 0.2 M extractant and shaken for at least 2 min. at 20°C . The phases were separated by centrifugation (5 min. at 5,000 rpm) and either 1.0 or 1.5 mL of each phase was transferred to a thin plastic tube. The tubes were placed in a gamma ray counting instrument with a NaI(Tl) scintillation detection system (Packard Auto-Gamma® 5530). The number of counts-per-minute (CPM) for each sample and for several blanks (background, BKG) were recorded.

Technetium-95m ($I = +1/2$) decays with a half-life of 61 days by isomeric transition (4%), positron emission (0.4%) and electron capture with gamma emission ($>95\%$).² Seventy percent of all decay events produce a gamma photon of energy 0.2042 MeV.² These are the photons that are counted (the lower and upper limits of photon energies counted by the instrument were set as 0.165 and 0.245 MeV, respectively).

The distribution ratio (K_d) is defined as the concentration of TcO_4^- in the organic phase (the extract) divided by the concentration of TcO_4^- remaining in the aqueous phase (the raffinate). K_d values were calculated as follows (the subscripts *o* and *a* refer to organic and aqueous phases, respectively):

$$K_d = (\text{CPM}_o - \text{BKG}) / (\text{CPM}_a - \text{BKG})$$

Our results are summarized in Table V, below. Even allowing for differences in anion extractant concentration, 1-methyl-3,5-didodecylpyridinium iodide is not a more effective extractant than Aliquat-336 nitrate, in either acidic or alkaline waste stream simulants, when the common solvent diisopropylbenzene (DIPB) was used. The search for alternative extractants must continue.

Several ketone solvents gave significantly higher K_d values than DIPB when Aliquat-336 nitrate was used as the extractant. For example, when the aqueous phase was 1 M NaOH and 1.5 M NaNO_3 , 3-nonanone containing 0.2 M Aliquat-336 nitrate gave a K_d of 410 while DIPB containing 0.2 M Aliquat-336 nitrate gave a K_d of 110. Of the alternate solvents studied, only 2,6-dimethyl-4-heptanone (diisobutylketone) extracted TcO_4^- to any extent on its own (i.e., without an anion extractant like Aliquat-336 nitrate added).

Table V. Extraction of TcO_4^- from Aqueous Waste Stream Simulants^a

aqueous phase	organic solvent	anion extractant	K_d
1 M HNO_3	DIPB	~ 0.1 M MDDP ⁺ I ⁻	3.6 ^b
1 M HNO_3	DIPB	~ 0.1 M DDP ⁺ Cl ⁻	4.9 ^b
1 M HNO_3	DIPB	0.2 M Aliquat-336 ⁺ NO ₃ ⁻	41 ^b
1 M HNO_3	2-NON	0.2 M Aliquat-336 ⁺ NO ₃ ⁻	1.4×10^2
1 M HNO_3	2-NON	0.1 M MDDP ⁺ I ⁻	43
1 M HNO_3	3-NON	0.2 M Aliquat-336 ⁺ NO ₃ ⁻	1.4×10^2
1 M HNO_3	TMCH	0.2 M Aliquat-336 ⁺ NO ₃ ⁻	2.1×10^2
1 M HNO_3	DMH	0.2 M Aliquat-336 ⁺ NO ₃ ⁻	3.7×10^2
1 M NaOH/1.5 M NaNO ₃	2-NON	0.1 M MDDP ⁺ I ⁻	63
1 M NaOH/1.5 M NaNO ₃	DIPB	~ 0.1 M MDDP ⁺ I ⁻	6.8
1 M NaOH/1.5 M NaNO ₃	DIPB	~ 0.1 M DDP ⁺ Cl ⁻	$< 1 \times 10^{-3}$
1 M NaOH/1.5 M NaNO ₃	DIPB	0.2 M Aliquat-336 ⁺ NO ₃ ⁻	1.1×10^2
1 M NaOH/1.5 M NaNO ₃	2-NON	0.2 M Aliquat-336 ⁺ NO ₃ ⁻	3.4×10^2
1 M NaOH/1.5 M NaNO ₃	3-NON	0.2 M Aliquat-336 ⁺ NO ₃ ⁻	4.1×10^2
1 M NaOH/1.5 M NaNO ₃	TMCH	0.2 M Aliquat-336 ⁺ NO ₃ ⁻	5.7×10^2
1 M NaOH/1.5 M NaNO ₃	EH	0.1 M Aliquat-336 ⁺ NO ₃ ⁻	4.0
1 M NaOH/1.5 M NaNO ₃	2-NON	none (neat solvent)	1.9×10^{-2}
1 M NaOH/1.5 M NaNO ₃	3-NON	none (neat solvent)	4.4×10^{-3}
1 M NaOH/1.5 M NaNO ₃	TMCH	none (neat solvent)	9.3×10^{-2}
1 M NaOH/1.5 M NaNO ₃	DMH	none (neat solvent)	20

^a Abbreviations: DIPB = diisopropylbenzene; 2-NON = 2-nonanone; 3-NON = 3-nonanone; TMCH = 3,3,5,5-tetramethylcyclohexanone; DMH = 2,6-dimethyl-4-heptanone; EH = 2-ethyl-1-hexanol; Aliquat-336⁺ = methyltricaprylammonium cation; DDP⁺ = 3,5-didodecylpyridinium cation; MDDP⁺ = 1-methyl-3,5-didodecylpyridinium cation. ^b 7.0% w/w 1-octanol was added to the organic phase to avoid third layer formation.

SECTION III — COMPARISON OF TcO_4^- AND ReO_4^- EXTRACTIONS

Some of the data from Tables I, II, IV, and V have been combined in Table VI, below. These are direct comparisons of K_d values for TcO_4^- and ReO_4^- extractions under similar or identical conditions. The data conclusively demonstrate that perrhenate is a suitable nonradioactive surrogate for pertechnetate as far as solvent extraction technology is concerned.

Table VI. Comparison of TcO_4^- and ReO_4^- Extractions from Aqueous Waste Stream Simulants^a

aqueous phase	organic solvent	anion extractant	$K_d (\text{TcO}_4^-)$	$K_d (\text{ReO}_4^-)$
1 M HNO_3	DIPB	0.2 M Aliquat-336 ⁺ NO_3^-	41 ^b	28 ^b
1 M HNO_3	2-NON	0.2 M Aliquat-336 ⁺ NO_3^-	1.4×10^2	56
1 M HNO_3	3-NON	0.2 M Aliquat-336 ⁺ NO_3^-	1.4×10^2	52
8 M HNO_3	DIPB	0.2 M Aliquat-336 ⁺ NO_3^-	0.40 ^b	0.61 ^{b,c}
1 M NaOH	DIPB	0.2 M Aliquat-336 ⁺ NO_3^-	5.0×10^2	3.0×10^3
5 M NaOH	DIPB	0.2 M Aliquat-336 ⁺ NO_3^-	6.9×10^2	6.1×10^3
1 M $\text{NaOH}/1.5 \text{ M } \text{NaNO}_3$	DIPB	0.2 M Aliquat-336 ⁺ NO_3^-	1.1×10^2	87
1 M $\text{NaOH}/1.5 \text{ M } \text{NaNO}_3$	DIPB	0.2 M Aliquat-336 ⁺ NO_3^-	59 ^b	29 ^b
1 M $\text{NaOH}/1.5 \text{ M } \text{NaNO}_3$	2-NON	0.2 M Aliquat-336 ⁺ NO_3^-	3.4×10^2	1.6×10^2
1 M $\text{NaOH}/1.5 \text{ M } \text{NaNO}_3$	3-NON	0.2 M Aliquat-336 ⁺ NO_3^-	4.1×10^2	1.8×10^2

^a Abbreviations: DIPB = diisopropylbenzene; 2-NON = 2-nonanone; 3-NON = 3-nonanone; Aliquat-336⁺ = methyltricaprylammonium cation. ^b 7.0% w/w 1-octanol was added to the organic phase to avoid third layer formation. ^c The nitric acid concentration for this experiment was 7.6 M instead of 8 M.

SECTION XI — POSSIBLE ALTERNATE EXTRACTANTS

We have started to examine extractants other than Aliquat-336 nitrate. This line of experimentation is driven by the desire to discover an extractant more effective than, and less prone to radiolysis than, Aliquat-336 nitrate. The extractant 1-methyl-3,5-didodecylpyridinium iodide was obtained from Professor R. A. Bartsch at Texas Tech University (the cation is shown below). We have converted this extractant to the nitrate salt. ones we have obtained or prepare are shown in Figure 1, below. In addition, we have also prepared 1-methyl-4-(1-butylpentyl)pyridinium nitrate. Other *N*-methylpyridinium nitrates, shown below as their cations, have been prepared.

Unfortunately, all of the compounds except for 1-methyl-3,5-didodecylpyridinium iodide and 1-methyl-3,5-didodecylpyridinium nitrate are *too soluble in water* to function as anion extractants in this work. Only these two pyridinium salts, and their 1-trimethylsilylmethyl analogs, will be used for future work.

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APPENDIX

Literature Review

CAS Online Search, July 1993

Notes: 14333-24-5 is ReO_4^-
14333-20-1 is TcO_4^-

=> s 14333-24-5 and extract?
388 14333-24-5

85108 EXTRACT?
L2 47 14333-24-5 AND EXTRACT?

L2 ANSWER 1 OF 47
AN CA118(18):176907v
TI Correlation parameters for predicting anion-exchange
extraction constants for 287
extraction systems
containing 236 different anions on an ES
computer with the program
OPAG2
AU Mezhov, E. A.; Reymarov, G. A.;
Khananishvili, N. L.; Schmidt, V. S.
LO Russia
SO Radiokhimiya, 34(1), 9-50
SC 68-2 (Phase Equilibriums, Chemical
Equilibriums, and Solutions)
SX 20, 48, 54
DT J
CO RADKAU
IS 0033-8311
PY 1992
LA Russ

L2 ANSWER 2 OF 47
AN CA118(2):12320x
TI Studies on the ***extraction*** of
perrhenate by use of crown
ethers
AU Jewad, S. K.; Al-Murab, S. R.; Jalhoom, M.
G.
CS Coll. Educ., Univ. Baghdad
LO Baghdad, Iraq
SO Process Metall., 7A(Solvent Extr. 1990, Pt.
A), 907-11
SC 68-2 (Phase Equilibriums, Chemical
Equilibriums, and Solutions)
SX 69
DT J
CO PMETEQ
PY 1992
LA Eng

L2 ANSWER 3 OF 47
AN CA116(20):206729s
TI ***Extraction*** and adsorption of chloro
complexes, perrhenate
(ReO_4^-), and tetrafluoroborate (BF_4^-) with
crown ethers and a crown
ether polymer
AU Onishi, Hiroshi; Koshima, Hideko
CS Dep. Chem., Univ. Tsukuba
LO Tsukuba 305, Japan
SO Anal. Sci., 7(Suppl., Proc. Int. Congr. Anal.
Sci., 1991, Pt. 1),
45-6

SC 79-0 (Inorganic Analytical Chemistry)
SX 68
DT J
CO ANSCEN
IS 0910-6340
PY 1991
LA Eng

L2 ANSWER 4 OF 47
AN CA115(22):246930m
TI ***Extraction*** spectrophotometric
study of the system of
tetrazolium violet-perrhenate-water-
chloroform. Determination of
rhenium in copper ore
AU Simeonova, Zh.; Aleksandrov, A.;
Stoimenov, N.
LO Bulg.
SO Nauchni Tr. - Plovdivski Univ., 27(5,
Khim.), 39-52
SC 79-6 (Inorganic Analytical Chemistry)
SX 68
DT J
CO NTPUB6
IS 0369-6227
PY 1989
LA Bulg

L2 ANSWER 5 OF 47
AN CA112(16):143191e
TI ***Extraction*** of the perrhenate anion
using goethite
surface-modified with hydrophobic
quaternary amines
AU Hudson, Michael J.; Tyler, Debra J.
CS Dep. Chem., Univ. Reading
LO Whiteknights/Reading RG6 2AD, UK
SO Hydrometallurgy, 24(1), 111-25
SC 54-2 (Extractive Metallurgy)
DT J
CO HYDRDA
IS 0304-386X
PY 1990
LA Eng

L2 ANSWER 6 OF 47
AN CA112(14):131212z
TI Anion ***extraction*** in the water-
inorganic salt-polar organic
solvent system
AU Shevchuk, I. A.; Makhno, A. Ya.
CS Donetsk. Gos. Univ.
LO Donetsk, USSR
SO Ukr. Khim. Zh. (Russ. Ed.), 55(4), 398-401
SC 79-1 (Inorganic Analytical Chemistry)
SX 68, 80
DT J
CO UKZHAU
IS 0041-6045
PY 1989
LA Russ

L2 ANSWER 7 OF 47
 AN CA110(8):68683v
 TI Effect of anions on direct potentiometric determination of potassium using ion-selective electrodes
 AU Egorov, V. V.; Lushchik, Ya. F.; Starobinets, G. L.
 CS NII Fiz.-Khim. Probl.
 LO Minsk, USSR
 SO Vestsi Akad. Navuk BSSR, Ser. Khim. Navuk, (3), 11-14
 SC 79-6 (Inorganic Analytical Chemistry)
 DT J
 CO VBSKAK
 IS 0002-3590
 PY 1988
 LA Russ

L2 ANSWER 8 OF 47
 AN CA108(8):63457y
 TI Studies on the ***extraction*** of rhenium(VII) with quaternary ammonium salt N263 and TOA [trioctylamine]
 AU Gai, Huifa; Gao, Zili; Sun, Sixiu; Shen, Jinglan
 CS Dep. Chem., Shandong Univ.
 LO Jinan, Peop. Rep. China
 SO Yingyong Huaxue, 4(5), 20-4
 SC 68-2 (Phase Equilibriums, Chemical Equilibriums, and Solutions)
 DT J
 CO YIHUED
 PY 1987
 LA Ch

L2 ANSWER 9 OF 47
 AN CA108(6):44665y
 TI ***Extraction*** of rhenium by crystal violet
 AU Gaibakyan, A. G.; Khachatryan, A. G.; Karapetyan, S. A.
 CS Erevan State Univ.
 LO USSR
 SO Zh. Anal. Khim., 42(11), 2093-5
 SC 68-2 (Phase Equilibriums, Chemical Equilibriums, and Solutions)
 SX 79
 DT J
 CO ZAKHA8
 IS 0044-4502
 PY 1987
 LA Russ

L2 ANSWER 10 OF 47
 AN CA106(26):221140e
 TI ***Extraction*** separation of rhenium by benzo-15-crown-5
 AU Zhou, Zhixian; Yang, Junying
 CS Dep. Chem., Zhengzhou Univ.
 LO Zhengzhou, Peop. Rep. China
 SO Huaxue Shiji, 9(1), 50-4
 SC 68-2 (Phase Equilibriums, Chemical Equilibriums, and Solutions)

DT J
 CO HUSHDR
 PY 1987
 LA Ch

L2 ANSWER 11 OF 47
 AN CA105(24):215336m
 TI ***Extraction*** of tungsten and rhenium by basic or neutral ***extractants*** in xylene from mineral acidic media
 AU Shabana, R.; Khalifa, S. M.; Abdalla, S.; Aly, H. F.
 CS Nucl. Chem. Dep., At. Energy Establ.
 LO Cairo, Egypt
 SO J. Radioanal. Nucl. Chem., 106(1), 55-63
 SC 71-6 (Nuclear Technology)
 SX 68
 DT J
 CO JRNCMDM
 IS 0236-5731
 PY 1986
 LA Eng

L2 ANSWER 12 OF 47
 AN CA105(22):198090g
 TI Thermodynamic investigation of the system perrhenate-tetrazolium salt-water-chloroform
 AU Alexandrov, A.; Simeonova, Zh.
 CS Univ. Plovdiv
 LO Plovdiv 4000, Bulg.
 SO Thermochim. Acta, 107, 123-9
 SC 69-2 (Thermodynamics, Thermochemistry, and Thermal Properties)
 SX 68
 DT J
 CO THACAS
 IS 0040-6031
 PY 1986
 LA Eng

L2 ANSWER 13 OF 47
 AN CA103(4):28116m
 TI Quantitative calculation of ***extraction*** equilibriums in an acridine dye-perrhenate-ion system
 AU Gaibakyan, A. G.
 LO USSR
 SO Khimiya i Khim. Tekhnol., Erevan, (2), 57-63
 From: Ref. Zh., Khim. 1985, Abstr. No. 8V207
 SC 68-2 (Phase Equilibriums, Chemical Equilibriums, and Solutions)
 DT J
 PY 1983
 LA Russ

L2 ANSWER 14 OF 47
 AN CA101(12):98623g
 TI Effect of solution ionic strength and temperature on the
 extraction of perrhenate associates of
 tris(1,10-phenanthroline)iron(II)
 AU Partman, A.; Udovenko, A. G.;
 Karmanova, E. G.; Belousov, E. A.
 CS Leningr. Tekhnol. Inst.
 LO Leningrad, USSR
 SO Zh. Neorg. Khim., 29(7), 1879-81
 SC 68-2 (Phase Equilibriums, Chemical Equilibriums, and Solutions)
 DT J
 CO ZNOKAQ
 IS 0044-457X
 PY 1984
 LA Russ

L2 ANSWER 15 OF 47
 AN CA97(8):61871j
 TI Quantitative description using linear relationships of free energies
 for a new set of anion-exchange
 extraction constants for a
 series of single-charged anions
 AU Shmidt, V. S.; Rybakov, K. A.; Rubisov, V. N.
 LO USSR
 SO Zh. Neorg. Khim., 27(6), 1519-22
 SC 68-2 (Phase Equilibriums, Chemical Equilibriums, and Solutions)
 SX 66, 69
 DT J
 CO ZNOKAQ
 IS 0044-457X
 PY 1982
 LA Russ

L2 ANSWER 16 OF 47
 AN CA94(14):109976q
 TI ***Extraction*** of rhenium(VII) by petroleum sulfoxides
 AU Numanov, I. U.; Akhmadieva, R. G.; Yusupova, N. A.
 CS Inst. Khim. im. Nikitina
 LO Dushanbe, USSR
 SO Dokl. Akad. Nauk Tadzh. SSR, 23(10), 582-5
 SC 68-1 (Phase Equilibriums, Chemical Equilibriums, and Solutions)
 DT J
 CO DANTAL
 IS 0002-3469
 PY 1980
 LA Russ

L2 ANSWER 17 OF 47
 AN CA93(16):156504y
 TI ***Extraction*** of rhenium from sulfuric acid solutions using
 neutral ***extractants***
 AU Adamova, A. Zh.; Ponomareva, E. I.

CS Inst. Metall. Obogashch.
 LO Kazan, USSR
 SO Kompleksn. Ispol'z. Miner. Syr'ya, (6), 75-7
 SC 68-1 (Phase Equilibriums, Chemical Equilibriums, and Solutions)
 DT J
 CO KIMSDD
 PY 1980
 LA Russ

L2 ANSWER 18 OF 47
 AN CA91(20):163442p
 TI ***Extraction*** chromatography of common anions in
 liquid-liquid anion exchange systems. Part. III. Monobasic
 aliphatic organic acids and their sodium salts as eluants
 AU Przeszlakowski, S.; Kocjan, R.
 CS Inst. Basic Chem. Sci., Med. Sch.
 LO Lublin 20-081, Pol.
 SO Chromatographia, 12(9), 587-94
 SC 66-2 (Surface Chemistry and Colloids)
 SX 79
 DT J
 CO CHRGB7
 IS 0009-5893
 PY 1979
 LA Eng

L2 ANSWER 19 OF 47
 AN CA91(12):97164w
 TI Use of liquid ***extraction*** membranes for selective recovery
 of metals in electrochemical processes
 AU Golubev, V. N.; Purins, B.
 CS Inst. Neorg. Khim.
 LO Riga, USSR
 SO Teor. Osn. Khim. Tekhnol., 13(3), 440-1
 SC 66-4 (Surface Chemistry and Colloids)
 SX 68, 80
 DT J
 CO TOKTA8
 IS 0040-3571
 PY 1979
 LA Russ

L2 ANSWER 20 OF 47
 AN CA91(10):79612m
 TI ***Extraction*** of elements as oxygen anions from alkaline
 solutions. IV. ***Extraction*** of rhenium(VII) with tributyl
 phosphate
 AU Dakar, G. M.; Iofa, B. Z.; Nesmeyanov, A. N.
 LO USSR
 SO Radiokhimiya, 21(3), 409-12
 SC 68-1 (Phase Equilibriums, Chemical Equilibriums, and Solutions)
 DT J
 CO RADKAU
 IS 0033-8311 PY 1979 LA Russ

L2 ANSWER 21 OF 47
 AN CA89(22):186470u
 TI Effect of a microcomponent on electrochemical and ***extraction*** properties of a liquid membrane in a macrocomponent solution
 AU Golubev, V. N.; Purins, B.; Filatova, T. A.; Nikolaev, N. I.; Chuvileva, G. G.
 CS Inst. Neorg. Khim.
 LO Riga, USSR
 SO Tezisy Dokl. - Vses. Konf. Ekstr., Volume 3, 6-8. Edited by: Purin, B. A. "Zinatne"; Riga, USSR.
 SC 66-4 (Surface Chemistry and Colloids)
 DT C
 CO 39BPAK
 PY 1977
 LA Russ

L2 ANSWER 22 OF 47
 AN CA89(22):186392v
 TI Study of the principles of ion transfer through liquid ***extraction*** membranes. II. Selectivity of ion transfer
 AU Golubev, V. N.; Purins, B.; Filatova, T. A.
 CS Inst. Neorg. Khim.
 LO Riga, USSR
 SO Latv. PSR Zinat. Akad. Vestis, Kim. Ser., (4), 456-8
 SC 66-2 (Surface Chemistry and Colloids)
 DT J
 CO LZAKAM
 IS 0002-3248
 PY 1978
 LA Russ

L2 ANSWER 23 OF 47
 AN CA89(12):95730n
 TI Time of equilibrium attainment in solvent ***extraction*** of halide complexes of metals with basic dyes
 AU Kish, P. P.; Balog, I. S.
 CS Uzhgorod State Univ.
 LO Uzhgorod, USSR
 SO Zh. Anal. Khim., 33(5), 871-7
 SC 68-1 (Phase Equilibriums, Chemical Equilibriums, and Solutions)
 DT J
 CO ZAKHA8
 IS 0044-4502
 PY 1978
 LA Russ

L2 ANSWER 24 OF 47
 AN CA88(24):177835u
 TI Organotin compounds as ***extractants*** . ***Extraction*** of oxygen-containing anions by dialkyltin dinitrates
 AU Spivakov, B. Ya.; Shkinev, V. M.; Zolotov, Yu. A.

CS Inst. Geokhim. Anal. Khim. im. Vernadskogo
 LO Moscow, USSR
 SO Org. Reagenty Anal. Khim., Tezisy Dokl. Vses. Konf., 4th, Volume 2, 110-11. Edited by: Pilipenko, A. T. "Naukova Dumka"; Kiev, USSR.
 SC 68-1 (Phase Equilibriums, Chemical Equilibriums, and Solutions)
 DT C
 CO 35THAO
 PY 1976
 LA Russ

L2 ANSWER 25 OF 47
 AN CA88(12):79495p
 TI ***Extraction*** chromatography of common anions in liquid-liquid anion exchange systems. I. Strong monobasic acids and their sodium salts as eluants
 AU Przeszlakowski, S.; Kocjan, R.
 CS Inst. Basic Chem. Sci., Med. Sch.
 LO Lublin, Pol.
 SO Chromatographia, 10(7), 358-63
 SC 66-2 (Surface Chemistry and Colloids)
 SX 79
 DT J
 CO CHRGB7
 PY 1977
 LA Eng

L2 ANSWER 26 OF 47
 AN CA87(4):29486v
 TI Effect of current pulse imposition on electrochemical transfer of ions through liquid ***extraction*** membranes
 AU Golubev, V. N.; Purins, B.
 CS Inst. Neorg. Khim.
 LO Riga, USSR
 SO Latv. PSR Zinat. Akad. Vestis, Kim. Ser., (2), 155-7
 SC 66-4 (Surface Chemistry and Colloids)
 SX 76
 DT J
 CO LZAKAM
 PY 1977
 LA Russ

L2 ANSWER 27 OF 47
 AN CA87(4):29225j
 TI Study of the characteristics of ion transfer through liquid ***extraction*** membranes. I. Diffusion transfer of ions
 AU Golubev, V. N.; Purins, B.; Filatova, T. A.
 CS Inst. Neorg. Khim.
 LO Riga, USSR
 SO Latv. PSR Zinat. Akad. Vestis, Kim. Ser., (2), 158-60
 SC 65-1 (General Physical Chemistry)
 DT J
 CO LZAKAM PY 1977 LA Russ

L2 ANSWER 28 OF 47
 AN CA86(16):111664q
 TI Features of the ***extraction*** of the
 perrhenate ion with
 basic acridine orange dye
 AU Tarayan, V. M.; Mirzoyan, F. V.;
 Sarkisyan, Zh. V.
 CS Erevan. Gos. Univ.
 LO Yerevan, USSR
 SO Dokl. Akad. Nauk Arm. SSR, 63(1), 36-41
 SC 68-1 (Phase Equilibriums, Chemical
 Equilibriums, and Solutions)
 SX 79
 DT J
 CO DANAAW
 PY 1976
 LA Russ

L2 ANSWER 29 OF 47
 AN CA85(18):136816h
 TI Study of liquid-liquid ***extraction*** of
 perrhenate with
 cyclohexanone in different media
 AU Jordanov, N.; Pavlova, M.; Bojkova, D.
 CS Inst. Gen. Inorg. Chem.
 LO Sofia, Bulg.
 SO Talanta, 23(6), 463-5
 SC 79-6 (Inorganic Analytical Chemistry)
 DT J
 CO TLNTA2
 PY 1976
 LA Eng

L2 ANSWER 30 OF 47
 AN CA84(16):112395y
 TI On the characteristics of ***extraction***
 of the perrhenate ion
 with the basic dye victoria blue 4R
 AU Tarayan, V. M.; Mirzoyan, F. V.;
 Sarkisyan, Zh. V.
 CS Erevan. Gos. Univ.
 LO Yerevan, USSR
 SO Arm. Khim. Zh., 28(12), 992-7
 SC 68-1 (Phase Equilibriums, Chemical
 Equilibriums, and Solutions)
 DT J
 CO AYKZAN
 PY 1975
 LA Russ

L2 ANSWER 31 OF 47
 AN CA83(22):184233w
 TI ***Extraction*** of astraphloxin salts
 AU Borisova, I. A.; Sergievskii, V. V.
 LO USSR
 SO Tr. Khim. Khim. Tekhnol., (3), 145-6
 SC 68-1 (Phase Equilibriums, Chemical
 Equilibriums, and Solutions)
 SX 79
 DT J
 CO TKKTAE
 PY 1974
 LA Russ

L2 ANSWER 32 OF 47
 AN CA83(18):153285k
 TI Mechanism of solvent ***extraction*** of
 perrhenate ions by
 cyclohexanone
 AU Iordanov, N.; Pavlova, M.; Boikova, D.
 CS Inst. Gen. Inorg. Chem.
 LO Sofia, Bulg.
 SO Proc. Int. Solvent Extr. Conf., Volume 3,
 2263-8. Edited by:
 Jeffreys, G. V. Soc. Chem. Ind.: London, Engl.
 SC 68-1 (Phase Equilibriums, Chemical
 Equilibriums, and Solutions)
 DT C
 CO 30XIAE
 PY 1974
 LA Eng

L2 ANSWER 33 OF 47
 AN CA83(14):121456a
 TI ***Extraction*** of perrhenate ion by the
 basic dye methyl green
 AU Tarayan, V. M.; Mirzoyan, F. V.;
 Sarkisyan, Zh. V.
 CS Erevan. Gos. Univ.
 LO Yerevan, USSR
 SO Arm. Khim. Zh., 27(10), 825-31
 SC 68-1 (Phase Equilibriums, Chemical
 Equilibriums, and Solutions)
 SX 79
 DT J
 CO AYKZAN
 PY 1974
 LA Russ

L2 ANSWER 34 OF 47
 AN CA83(10):87311n
 TI Conductivity of model ***extraction***
 membranes in the presence
 of thiooxine and several of its derivatives
 AU Golubev, V. N.; Purins, B.
 CS Inst. Neorg. Khim.
 LO Riga, USSR
 SO Latv. PSR Zinat. Akad. Vestis, Kim. Ser.,
 (1), 40-3
 SC 72-12 (Electrochemistry)
 SX 76
 DT J
 CO LZAKAM
 PY 1975
 LA Russ

L2 ANSWER 35 OF 47
 AN CA81(26):17772b
 TI Electrochemical transfer of some anions through liquid ***extraction*** membrane (trioctylamine-
 amyl alcohol)
 AU Golubev, V. N.; Purins, B.; Filatova, T. A.
 CS Inst. Inorg. Chem.
 LO Riga, USSR
 SO Latv. PSR Zinat. Akad. Vestis, Kim. Ser., (4), 450-3
 SC 68-4 (Phase Equilibriums, Chemical Equilibriums, and Solutions)
 SX 66
 DT J
 CO LZAKAM
 PY 1974
 LA Russ

L2 ANSWER 36 OF 47
 AN CA81(26):176557y
 TI Electrochemical transfer of perrhenate ions through the ***extraction*** membranes
 AU Golubev, V. N.; Purins, B.; Filatova, T. A.
 CS Inst. Neorg. Khim.
 LO Riga, USSR
 SO Latv. PSR Zinat. Akad. Vestis, Kim. Ser., (3), 259-61
 SC 66-2 (Surface Chemistry and Colloids)
 DT J
 CO LZAKAM
 PY 1974
 LA Russ

L2 ANSWER 37 OF 47
 AN CA81(26):176554v
 TI Ionic selectivity of model ***extraction*** membranes
 AU Golubev, V. N.; Purins, B.
 CS Inst. Neorg. Khim.
 LO Riga, USSR
 SO Novosti Elektrokhim. Org. Soedin., Tezisy Dokl. Vses. Soveshch. Elektrokhim. Org. Soedin., 8th, Meeting Date 1973, 121. Edited by: Feoktistov, L. G. "Zinatne": Riga, USSR.
 SC 66-2 (Surface Chemistry and Colloids)
 DT C
 CO 28TSAX
 PY 1973
 LA Russ

L2 ANSWER 38 OF 47
 AN CA81(24):159863c
 TI Indirect evaluation of the selectivity of liquid ***extraction*** membranes
 AU Golubev, V. N.; Purins, B.
 CS Inst. Inorg. Chem.
 LO Riga, USSR
 SO Latv. PSR Zinat. Akad. Vestis, Kim. Ser., (4), 443-6

SC 68-2 (Phase Equilibriums, Chemical Equilibriums, and Solutions)
 SX 66
 DT J
 CO LZAKAM
 PY 1974
 LA Russ

L2 ANSWER 39 OF 47
 AN CA81(6):30248b
 TI Solvent ***extraction*** from molten salts. X. ***Extraction*** of perrhenate by alkylammonium salts
 AU David-Auslaender, J.; Zangen, M.; Kertes, A. S.
 CS Dep. Inorg. Phys. Chem., Soreq Nucl. Res. Cent.
 LO Yavne, Israel
 SO J. Inorg. Nucl. Chem., 36(2), 425-30
 SC 68-1 (Phase Equilibriums, Chemical Equilibriums, and Solutions)
 DT J
 CO JINCAO
 PY 1974
 LA Eng

L2 ANSWER 40 OF 47
 AN CA80(4):20030q
 TI Possibility of ***extraction*** of rhenium(VII) with some carbonyl group-containing organic compounds
 AU Kalcheva, V.; Angelova, V.; Doicheva, R.; Simov, D.
 CS Sofia Univ.
 LO Sofia, Bulg.
 SO God. Sofii. Univ., Khim. Fak., Volume Date 1969-1970, 64, 21-31
 SC 68-1 (Phase Equilibriums, Chemical Equilibriums, and Solutions)
 DT J
 CO GSKFAL
 PY 1972
 LA Bulg

L2 ANSWER 41 OF 47
 AN CA77(10):66698e
 TI ***Extraction*** of some anions from molten lithium nitrate-potassium nitrate by tetraoctylphosphonium nitrate in polyphenyl or 1-nitronaphthalene solvent
 AU Tan, Zoilo C. H.; Irvine, J. W., Jr.
 CS Dep. Chem., Massachusetts Inst. Technol.
 LO Cambridge, Mass., USA
 SO Inorg. Chem., 11(7), 1701-7
 SC 68-1 (Phase Equilibriums, Chemical Equilibriums, and Solutions)
 DT J
 CO INOCAJ
 PY 1972
 LA Eng

L2 ANSWER 42 OF 47
AN CA76(18):107600s
TI Analytical properties of the indicator Nile Blue. II.

Extraction -photometric
determination of some anions with the
blue form of Nile Blue

AU Savic, M.; Savic, J.
CS Inst. Chem., Fac. Sci.
LO Sarajevo, Yugoslavia
SO Glas. Hem. Tehnol. Bosne Hercegovine,
No. 17, 5-11
SC 79 (Inorganic Analytical Chemistry)
DT J
CO GHTBAB
PY 1969
LA Fr

L2 ANSWER 43 OF 47
AN CA75(4):26041n
TI Equilibriums in perrhenate ion-bis-(4-
methylbenzylaminophenyl)antipy
rylcarbinol-organic solvent ***extraction***
systems

AU Busev, A. I.; Dzintarnieks, M.; Rudzitis,
G.; Ogareva, M. B.
CS M. V. Lomonosov Moscow State Univ.
LO Moscow, USSR
SO Zh. Anal. Khim., 26(3), 521-31
SC 68 (Phase Equilibriums, Chemical
Equilibriums, and Solutions)
DT J
CO ZAKHA8
PY 1971
LA Russ

L2 ANSWER 44 OF 47
AN CA69(18):70572m
TI Organic oxides as ***extractants*** for
metal anions

AU Krasovec, F.; Klofutar, C.
CS Inst. "Jozef Stefan"
LO Ljubljana, Yugoslavia
SO Solvent Extr. Chem., Proc. Int. Conf.,
Goteborg, Volume Date 1966
509-16

SC 68 (Phase Equilibriums, Chemical
Equilibriums, and Solutions)
DT J
CO 19CVAL
PY 1967
LA Eng

L2 ANSWER 45 OF 47
AN CA69(18):70548h
TI Solvent ***extraction*** of some anions
from molten $\text{NH}_4\text{NO}_3 \cdot 2\text{H}_2\text{O}$
with tetraheptylammonium nitrate
AU Nikolic, R. M.; Gal, I. J.
CS Boris Kidric Inst. Nucl. Sci.
LO Belgrade, Yugoslavia
SO J. Inorg. Nucl. Chem., 30(7), 1963-9
SC 68 (Phase Equilibriums, Chemical
Equilibriums, and Solutions)

DT J
CO JINCAO
PY 1968
LA Eng

L2 ANSWER 46 OF 47
AN CA67(16):76688j
TI Properties of anions controlling the
extractability of
their associates with triarylmethane dyes

AU Lomonosov, S. A.; Nikolaev, A. V.
CS Ural'sk. Nauch.-Issled. Khim. Inst.
LO Sverdlovsk, USSR
SO Zh. Strukt. Khim., 8(2), 216-20
SC 68 (Phase Equilibriums, Chemical
Equilibriums, and Solutions)
DT J
CO ZSTKAI
PY 1967
LA Russ

L2 ANSWER 47 OF 47
AN CA67(12):57672h
TI Ion exchange ***extraction*** of rhenium
from alkaline solution

AU Lebedev, K. B.; Ageev, S. A.
SO Izv. Akad. Nauk Kaz. SSR, Ser. Khim.,
17(2), 5-11
SC 68 (Phase Equilibriums, Chemical
Equilibriums, and Solutions)
DT J
CO IKAKAK
PY 1967
LA Russ

=> s rhenium and spectrophotometric
14660 RHENIUM
36745 SPECTROPHOTOMETRIC

L3 189 RHENIUM AND
SPECTROPHOTOMETRIC

=> s l3 and quantitative
39519 QUANTITATIVE
L4 1 L3 AND QUANTITATIVE

=> d l4

L4 ANSWER 1 OF 1
AN CA78(12):79308y
TI Morpholinium morpholine-N-
dithiocarbamate as a reagent in
quantitative analysis. IX.
Spectrophotometric
determination of ***rhenium***

AU Likussar, W.; Beyer, W.
CS Inst. Anorg. Anal. Chem., Univ. Graz
LO Graz, Austria
SO Mikrochim. Acta, (2), 211-17
SC 79-6 (Inorganic Analytical Chemistry)
DT J
CO MIACAQ
PY 1973
LA Ger

=> s l3 and thiocyanate
14139 THIOCYANATE
L5 19 L3 AND THIOCYANATE

=> d l5 1-19

L5 ANSWER 1 OF 19
AN CA117(22):225311m
TI Ascorbic acid as a new reductant in the
thiocyanate method
for the ***spectrophotometric***
determination of
rhenium
AU Wahi, Anu; Kakkar, L. R.
CS Dep. Chem., Kurukshetra Univ.
LO Kurukshetra 132119, India
SO Fresenius' J. Anal. Chem., 343(12), 904-5
SC 79-2 (Inorganic Analytical Chemistry)
SX 73
DT J
CO FJACES
IS 0937-0633
PY 1992
LA Eng

L5 ANSWER 2 OF 19
AN CA113(16):144420m
TI Extraction- ***spectrophotometric***
determination of molybdenum,
tungsten and ***rhenium*** with
thiocyanate and
thioacetanilide
AU Mishra, N.; Ghosh, A.; Mishra, R. K.;
Patel, K. S.
CS Dep. Chem., Ravishankar Univ.
LO Raipur 492010, India
SO Anal. Sci., 6(3), 407-10
SC 79-6 (Inorganic Analytical Chemistry)
SX 61
DT J
CO ANSCEN
IS 0910-6340
PY 1990
LA Eng

L5 ANSWER 3 OF 19
AN CA112(18):171217m
TI Extraction and ***spectrophotometric***
determination of
rhenium (VII) with
thiocyanate and amides
AU Mishra, Neera; Sinha, S. K.; Patel, K. S.;
Mishra, R. K.
CS Dep. Chem., Ravishankar Univ.
LO Raipur 492010, India
SO Bull. Chem. Soc. Jpn., 62(10), 3400-2
SC 79-6 (Inorganic Analytical Chemistry)
DT J
CO BCSJA8
IS 0009-2673
PY 1989
LA Eng

L5 ANSWER 4 OF 19

AN CA109(6):47486x
TI Extraction and ***spectrophotometric***
determination of
rhenium with ***thiocyanate***
and hydroxamic acids
AU Sharma, Indrani; Chakraborty, A. K.
CS Dep. Chem., Jadavpur Univ.
LO Calcutta 700 032, India
SO Indian J. Chem., Sect. A, 27A(3), 271-3
SC 79-6 (Inorganic Analytical Chemistry)
DT J
CO IJCADU
IS 0376-4710
PY 1988
LA Eng

L5 ANSWER 5 OF 19
AN CA108(8):67959m
TI ***Spectrophotometric*** determination
of chloride in
platinum-alumina/silica catalysts with
mercuric ***thiocyanate***
-iron(3+) reagent
AU Koshy, V. J.; Garg, V. N.
CS Res. Cent., Indian Petrochem. Corp. Ltd.
LO Baroda 391 346, India
SO Talanta, 34(11), 905-8
SC 79-6 (Inorganic Analytical Chemistry)
DT J
CO TLNTA2
IS 0039-9140
PY 1987
LA Eng

L5 ANSWER 6 OF 19
AN CA107(22):211154u
TI Ion-association complex of ***rhenium***
(IV)- ***thiocyanate***
with metoclopramide hydrochloride
AU Ramappa, P. G.; Ramachandra, K. S.
CS Dep. Chem.
LO Mysore 570006, India
SO J. Inst. Chem. (India), 59(2), 115
SC 79-6 (Inorganic Analytical Chemistry)
DT J
CO JOICA7
IS 0020-3254
PY 1987
LA Eng

L5 ANSWER 7 OF 19
AN CA105(26):237503r
TI An improved ***thiocyanate*** method
for the determination of
rhenium
AU Yatirajam, V.; Khaira, Sirpal; Kakkar, L.
R.
CS Dep. Chem., Kurukshetra Univ.
LO Kurukshetra 132 119, India
SO Indian J. Chem., Sect. A, 25A(9), 879-81
SC 79-2 (Inorganic Analytical Chemistry)
DT J
CO IJCADU
IS 0376-4710 PY 1986 LA Eng

L5 ANSWER 8 OF 19
 AN CA98(16):136793s
 TI Solvent extraction and
 spectrophotometric determination of
 rhenium using ***thiocyanate***
 and chlorpromazine
 AU Ramappa, P. G.; Gowda, H. Sanke;
 Manjappa, S.
 CS Dep. Post-Grad. Stud. Res. Chem., Univ.
 Mysore
 LO Mysore 570 006, India
 SO J. Inst. Chem. (India), 54(6), 271-2
 SC 79-6 (Inorganic Analytical Chemistry)
 DT J
 CO JOICA7
 IS 0020-3254
 PY 1982
 LA Eng

L5 ANSWER 9 OF 19
 AN CA97(14):119669t
 TI Improvement of the extraction-
 spectrophotometric
 thiocyanate method for the
 determination of ***rhenium***
 by addition of imipramine
 AU Nayak, Anant N.; Manjappa, S.;
 Ramappa, P. G.; Yathirajan, H. S.
 CS Dep. Chem., Govt. Coll. Boys
 LO Mandya 571 401, India
 SO Fresenius' Z. Anal. Chem., 309(5), 396
 SC 79-6 (Inorganic Analytical Chemistry)
 DT J
 CO ZACFAU
 IS 0016-1152
 PY 1981
 LA Eng

L5 ANSWER 10 OF 19
 AN CA92(12):103664y
 TI Direct extraction of complex
 thiocyanate anions with a
 chloroform solution of a cation-active tenside
 AU Malat, M.
 CS Dep. Anal. Chem., Charles Univ.
 LO Prague CS-12840/2, Czech.
 SO Fresenius' Z. Anal. Chem., 297(5), 417
 SC 79-4 (Inorganic Analytical Chemistry)
 DT J
 CO ZACFAU
 IS 0016-1152
 PY 1979
 LA Eng

L5 ANSWER 11 OF 19
 AN CA90(20):161611y
 TI Liquid-liquid extraction of a
 rhenium - ***thiocyanate***
 complex with hexamethylphosphoramide
 and direct
 spectrophotometric determination in
 the organic phase
 AU Mitra, Monidipa; Mitra, B. K.
 CS Dep. Chem., Jadavpur Univ.

LO Calcutta, India
 SO Talanta, 25(10), 597-9
 SC 79-6 (Inorganic Analytical Chemistry)
 SX 73
 DT J
 CO TLNTA2
 IS 0039-9140
 PY 1978
 LA Eng

L5 ANSWER 12 OF 19
 AN CA89(16):139893z
 TI Solvent extraction and
 spectrophotometric determination of
 rhenium (VII) using mixed ligands
 AU Savariar, C. P.; Hariharan, T. R.
 CS Dep. Chem., Univ. Calicut
 LO Calicut, India
 SO J. Indian Chem. Soc., 55(4), 349-51
 SC 79-6 (Inorganic Analytical Chemistry)
 DT J
 CO JICSAH
 IS 0019-4522
 PY 1978
 LA Eng

L5 ANSWER 13 OF 19
 AN CA86(12):83217a
 TI Improvement of some procedures for
 photometric determination of
 rhenium
 AU Stefanov, S.; Iordanov, N.; Pavlova, M.
 CS Inst. Gen. Inorg. Chem.
 LO Sofia, Bulg.
 SO Mikrochim. Acta, 2(5-6), 449-53
 SC 79-6 (Inorganic Analytical Chemistry)
 DT J
 CO MIACAQ
 PY 1976
 LA Ger

L5 ANSWER 14 OF 19
 AN CA83(14):125670p
 TI Extraction- ***spectrophotometric***
 method for the determination
 of ***rhenium*** using mixed ligands
 AU Savariar, C. P.; Hariharan, T. R.
 CS Dep. Chem., Univ. Calicut
 LO Calicut, India
 SO Mikrochim. Acta, (5-6), 477-83
 SC 79-6 (Inorganic Analytical Chemistry)
 DT J
 CO MIACAQ
 PY 1975
 LA Eng

L5 ANSWER 15 OF 19
 AN CA77(10):69772k
 TI Determination of ***rhenium*** by a
 thiocyanate method
 in the absence of an extractant
 AU Ermolaev, M. I.; Gukova, Yu. Ya.;
 Kuznetsova, N. A.
 LO USSR
 SO Tr. Voronezh. Tekhnol. Inst., No. 18, 74-5
 From: Ref. Zh., Khim. 1971, Abstr. No.
 15G116
 SC 79-6 (Inorganic Analytical Chemistry)
 DT J
 PY 1970
 LA Russ

L5 ANSWER 16 OF 19
 AN CA71(20):98060h
 TI ***Spectrophotometric*** determination
 of ***thiocyanate***
 with ***rhenium***
 AU Neas, Robert E.; Guyon, John C.
 CS Univ. of Missouri
 LO Columbus, Mo., USA
 SO Anal. Chem., 41(11), 1470-3
 SC 79 (Inorganic Analytical Chemistry)
 DT J
 CO ANCHAM
 PY 1969
 LA Eng

L5 ANSWER 17 OF 19
 AN CA70(14):63978r
 TI ***Spectrophotometric*** determination
 of trace amounts of
 rhenium
 AU Basinska, Maria; Rutkowski, Wladyslaw
 CS Inst. Badan Jadrowych
 LO Warsaw, Poland
 SO Chem. Anal. (Warsaw), 13(4), 799-807
 SC 79 (Inorganic Analytical Chemistry)
 DT J
 CO CANWAJ
 PY 1968
 LA Pol

L5 ANSWER 18 OF 19
 AN CA69(4):15875n
 TI The ***thiocyanate*** method for the
 photometric determination
 of ***rhenium***
 AU Iordanov, N.; Pavlova, M.
 CS Bulgarian Acad. Sci.
 LO Sofia, Bulg.
 SO Proc. Conf. Appl. Phys.-Chem. Methods
 Chem. Anal., Budapest, 3, 81-9
 SC 79 (Inorganic Analytical Chemistry)
 DT J
 CO 19SWA2
 PY 1966
 LA Eng

L5 ANSWER 19 OF 19
 AN CA66(16):72181v

TI Analytical studies of ***rhenium*** III.
 Spectrophotometric determination of
 rhenium with
 thiocyanate and anion exchange
 separation of molybdenum and
 rhenium
 AU Kojima, Masuo; Okubo, Teiji
 SO Tokyo Kogyo Shikensho Hokoku, 61(9),
 372-7
 SC 79 (Inorganic Analytical Chemistry)
 DT J
 CO TKSHAI
 PY 1966
 LA Japan

=> s rhenium and recovery
 14660 RHENIUM
 97670 RECOVERY
 L6 325 RHENIUM AND RECOVERY

=> s l6 and 14333-24-5
 388 14333-24-5
 L7 7 L6 AND 14333-24-5

=> d l7 1-7

L7 ANSWER 1 OF 7
 AN CA110(16):138169h
 TI Elution of ***rhenium*** from anion
 exchangers
 AU Pfrepper, Gerd
 CS Akademie der Wissenschaften der DDR
 LO Ger. Dem. Rep.
 SO Ger. (East), 3 pp.
 PI DD 260227 A1 21 Sep 1988
 AI DD 87-302368 4 May 1987
 IC ICM B01D015-04
 SC 49-9 (Industrial Inorganic Chemicals)
 DT P
 CO GEXXA8
 PY 1988
 LA Ger

L7 ANSWER 2 OF 7
 AN CA109(4):25697q
 TI ***Recovery*** of ***rhenium*** from
 sulfate solutions
 containing zinc
 AU Balakin, S. M.; Khudyakov, I. F.;
 Rychkov, V. N.
 CS Ural. Politekh. Inst.
 LO Sverdlovsk, USSR
 SO Kompleksn. Ispol'z. Miner. Syr'ya, (2), 29-
 33
 SC 54-2 (Extractive Metallurgy)
 DT J
 CO KIMSDD
 PY 1988
 LA Russ

L7 ANSWER 3 OF 7
 AN CA102(10):81046u
 TI ***Recovery*** of ***rhenium*** salts
 from aqueous solutions
 of perrhenates
 AU Petrovich, V. A.; Tabulina, L. V.;
 Arzhanov, S. I.
 CS MRTI
 LO USSR
 SO Khim. Khim. Tekhnol. (Minsk), 19, 47-9
 SC 49-5 (Industrial Inorganic Chemicals)
 SX 54
 DT J
 CO KKTEDK
 PY 1984
 LA Russ

L7 ANSWER 4 OF 7
 AN CA99(18):142455v
 TI ***Recovery*** of perrhenate compounds
 from aqueous solutions
 AU Gerisch, Siegfried
 CS VEB Mansfeld-Kombinat "Wilhelm
 Pieck"; Forschungsinstitut fuer
 NE-Metalle
 LO Ger. Dem. Rep.
 SO Ger. (East), 16 pp.
 PI DD 200566 Z 18 May 1983
 AI DD 81-232734 24 Aug 1981
 IC C01G047-00
 SC 49-5 (Industrial Inorganic Chemicals)
 SX 54
 DT P
 CO GEXXA8
 PY 1983
 LA Ger

L7 ANSWER 5 OF 7
 AN CA91(24):201201u
 TI Redox potential-pH diagram of the
 rhenium -sulfur-water
 system
 AU Kanimov, K. K.; Ogorodnikov, Yu. I.
 CS Inst. Metall. Obogashch.
 LO Alma-Ata, USSR
 SO Deposited Doc., VINITI 2913-78, 14 pp.
 Avail. VINITI
 SC 72-12 (Electrochemistry)
 SX 54, 69
 DT T
 PY 1978
 LA Russ

L7 ANSWER 6 OF 7
 AN CA73(22):113294z
 TI Use of acidified urea solutions as a
 rhenium desorbent
 AU Suvorovskaya, N. A.; Shikhova, V. V.;
 Shmarinova, I. A.; Karavaeva,
 S. D.
 LO USSR
 SO Nauch. Soobshch., Inst. Gorn. Dela,
 Moscow, 47, 39-41
 From: Ref. Zh., Khim. 1970 Abstr. No. 2G112

SC 66 (Surface Chemistry and Colloids)
 DT J
 CO NSIGBO
 PY 1969
 LA Russ

L7 ANSWER 7 OF 7
 AN CA72(22):114073t
 TI Flotation of anions with the aid of cationic
 surfactants. II.
 Flotation of perrhenates
 AU Charewicz, Witold; Niemiec, Jan
 CS Polytech.
 LO Wroclaw, Poland
 SO Nukleonika, 14(6), 607-17
 SC 54 (Extractive Metallurgy)
 DT J
 CO NUKLAS
 PY 1969
 LA Eng

=> s rhenium and redox(w)potentials
 14660 RHENIUM
 33790 REDOX
 18448 POTENTIALS
 910 REDOX(W)POTENTIALS

L8 15 RHENIUM AND
 REDOX(W)POTENTIALS

=> d l8 1-15

L8 ANSWER 1 OF 15
 AN CA118(18):178762t
 TI Electron-transfer behavior of
 oxorhenium(V), nitridorhenium(V) and
 rhenium (III)
 diethyldithiocarbamate complexes
 AU Holder, Grant N.; Kanning, Mark W.
 CS Dep. Chem., Appalachian State Univ.
 LO Boone, NC 28608, USA
 SO Inorg. Chim. Acta, 197(1), 67-73
 SC 72-2 (Electrochemistry)
 SX 66, 78
 DT J
 CO ICHAA3
 IS 0020-1693
 PY 1992
 LA Eng

L8 ANSWER 2 OF 15
 AN CA118(16):159836d
 TI Coordination compounds of
 pentaaminerhenium(III/II)
 AU Orth, Stephen D.; Barrera, Joseph; Sabat,
 Michal; Harman, W. Dean
 CS Dep. Chem., Univ. Virginia
 LO Charlottesville, VA 22901, USA
 SO Inorg. Chem., 32(5), 594-601
 SC 78-7 (Inorganic Chemicals and Reactions)
 SX 68, 75
 DT J
 CO INOCAJ
 IS 0020-1669
 PY 1993 LA Eng OS CJACS

L8 ANSWER 3 OF 15
 AN CA118(16):159807v
 TI Complexes of 3-hydroxypyridin-2-one and 1,2-dimethyl-3-hydroxypyridin-4-one with second and third row elements of groups 6, 7 and 8
 AU Griffith, William P.; Mostafa, Sahar I.
 CS Dep. Chem., Imp. Coll. Sci. Technol. Med.
 LO London SW7 2AY, UK
 SO Polyhedron, 11(23), 2997-3005
 SC 78-7 (Inorganic Chemicals and Reactions)
 DT J
 CO PLYHDE
 IS 0277-5387
 PY 1992
 LA Eng

L8 ANSWER 4 OF 15
 AN CA118(8):72400h
 TI Luminescence and intramolecular energy-transfer processes in isomeric cyano-bridged ***rhenium*** (I)-***rhenium*** (I) and ***rhenium*** (I)-ruthenium(II)-***rhenium*** (I) polypyridyl complexes
 AU Kalyanasundaram, K.; Graetzel, M.; Nazeeruddin, M. K.
 CS Inst. Chim. Phys., Ec. Polytech. Fed.
 LO Lausanne CH-1015, Switz.
 SO Inorg. Chem., 31(25), 5243-53
 SC 78-7 (Inorganic Chemicals and Reactions)
 SX 72, 73
 DT J
 CO INOCAJ
 IS 0020-1669
 PY 1992
 LA Eng
 OS CJACS

L8 ANSWER 5 OF 15
 AN CA113(14):125259z
 TI Ligand-bridged homo- and hetero-binuclear carbonyl polypyridyl complexes of ***rhenium*** (I): syntheses, electronic spectra, redox, and luminescence behavior
 AU Kalyanasundaram, Kuppaswamy; Nazeeruddin, Mohammad K.
 CS Inst. Chim. Phys., Ec. Polytech. Fed. Lausanne
 LO Lausanne CH-1015, Switz.
 SO J. Chem. Soc., Dalton Trans., (5), 1657-62
 SC 78-7 (Inorganic Chemicals and Reactions)
 SX 72, 73
 DT J
 CO JCDTBI
 IS 0300-9246
 PY 1990
 LA Eng
 OS CJRSC

L8 ANSWER 6 OF 15

AN CA112(26):244838b
 TI Stabilization of biochemical relevant intermediates by metal coordination. IV. ***Rhenium*** (I) complexes of flavin- and pterin-analogous nitrogen-oxygen chelate ligands
 AU Bessenbacher, Christian; Kaim, Wolfgang
 CS Inst. Anorg. Chem., Univ. Stuttgart
 LO Stuttgart D-7000/80, Fed. Rep. Ger.
 SO Z. Anorg. Allg. Chem., 577, 39-52
 SC 78-7 (Inorganic Chemicals and Reactions)
 SX 72, 73
 DT J
 CO ZAACAB
 IS 0044-2313
 PY 1989
 LA Ger

L8 ANSWER 7 OF 15
 AN CA112(14):127586g
 TI Electrochemical parametrization of metal complex ***redox*** potentials***, using the ruthenium(III)/ruthenium(II) couple to generate a ligand electrochemical series
 AU Lever, A. B. P.
 CS Dep. Chem., York Univ.
 LO North York, ON M3J 1P3, Can.
 SO Inorg. Chem., 29(6), 1271-85
 SC 72-2 (Electrochemistry)
 SX 29, 78
 DT J
 CO INOCAJ
 IS 0020-1669
 PY 1990
 LA Eng
 OS CJACS

L8 ANSWER 8 OF 15
 AN CA111(8):69802r
 TI Stability range of heterometal cubane-type clusters MFe₃S₄: assembly of double-cubane clusters with the ***rhenium***-iron-sulfur [[ReFe₃S₄]] core
 AU Ciurli, Stefano; Carney, Michael J.; Holm, R. H.; Papaefthymiou, G.
 C
 CS Dep. Chem., Harvard Univ.
 LO Cambridge, MA 02138, USA
 SO Inorg. Chem., 28(14), 2696-8
 SC 78-7 (Inorganic Chemicals and Reactions)
 SX 75
 DT J
 CO INOCAJ
 IS 0020-1669
 PY 1989
 LA Eng
 OS CJACS

L8 ANSWER 9 OF 15
 AN CA110(18):164966k
 TI Synthesis, optical, photophysical, and redox properties of a ligand-bridged heteronuclear complex
 (OC)5W(py₂)Re(CO)4Cl (py₂ = pyrazine)
 AU Zulu, Mthembeni M.; Lees, Alistair J.
 CS Dep. Chem., State Univ. New York
 LO Binghamton, NY 13901, USA
 SO Organometallics, 8(4), 955-60
 SC 78-7 (Inorganic Chemicals and Reactions)
 SX 72, 73, 74
 DT J
 CO ORGND7
 IS 0276-7333
 PY 1989
 LA Eng
 OS CJACS

L8 ANSWER 10 OF 15
 AN CA108(13):112170k
 TI Polybipyridine ligands derived from acyclic and macrocyclic polyamines; synthesis and metal-binding studies
 AU Lehn, Jean Marie; Ziessel, Raymond
 CS Inst. Le Bel, Univ. Louis Pasteur
 LO Strasbourg F-67000, Fr.
 SO J. Chem. Soc., Chem. Commun., (17), 1292-4
 SC 27-16 (Heterocyclic Compounds (One Hetero Atom))
 SX 78
 DT J
 CO JCCCAT
 IS 0022-4936
 PY 1987
 LA Eng
 OS CASREACT 108:112170; CJRSC

L8 ANSWER 11 OF 15
 AN CA108(8):65856b
 TI Photo- and electrochemical reduction of carbon dioxide
 AU Ziessel, Raymond
 CS Inst. Le Bel, Univ. Louis Pasteur
 LO Strasbourg 67000, Fr.
 SO NATO ASI Ser., Ser. C, 206(Carbon Dioxide Source Carbon: Biochem. Chem. Uses), 113-38
 SC 74-1 (Radiation Chemistry, Photochemistry, and Photographic and Other Reprographic Processes)
 SX 52, 67, 72
 DT J
 CO NSCSDW
 PY 1987
 LA Eng

L8 ANSWER 12 OF 15
 AN CA93(16):160405j
 TI Structures and redox behavior of transition metal complexes formed

with cyclic tetrapyrroles - syntheses of monomeric metal complexes for development of polymer materials having electric conductivity
 AU Murakami, Yukito; Matsuda, Yoshihisa; Yamada, Sunao; Goto, Takashi; Kuramoto, Masahiko
 CS Fac. Eng., Kyushu Univ.
 LO Fukuoka, Japan
 SO Kenkyu Hokoku - Asahi Garasu Kogyo Gijutsu Shoreikai, 34, 295-312
 SC 78-7 (Inorganic Chemicals and Reactions)
 SX 72
 DT J
 CO AGKGAA
 IS 0365-2599
 PY 1979
 LA Japan

L8 ANSWER 13 OF 15
 AN CA73(10):51511g
 TI ***Rhenium*** oxides. I. ***Rhenium*** trioxide electrode potentials in acid media
 AU Poisson, Regis; Chartier, Pierre; Brenet, Jean
 CS Lab. Electrochim. Chim. Phys. Crops Solide, Inst. Chim.
 LO Strasbourg, Fr.
 SO Bull. Soc. Chim. Fr., (4), 1275-8
 SC 77 (Electrochemistry)
 DT J
 CO BSCFAS
 PY 1970
 LA Fr

L8 ANSWER 14 OF 15
 AN CA71(22):106346y
 TI Correlation of standard oxidation-reduction potentials with crystal chemical parameters in oxygen compounds of some transition metals
 AU Goncharenko, A. S.
 LO USSR
 SO Zh. Neorg. Khim., 14(8), 2053-5
 SC 70 (Crystallization and Crystal Structure)
 DT J
 CO ZNOKAQ
 PY 1969
 LA Russ

L8 ANSWER 15 OF 15
 AN CA70(4):16589e
 TI ***Redox*** potentials*** of ***rhenium*** in hydrochloric and sulfuric acid solutions
 AU Henze, Guenter; Geyer, Rudolf
 CS Tech. Hochsch. Chem. "Carl Schorlemmer" Leuna-Merseburg
 LO Merseburg, Ger.
 SO Z. Chem., 8(9), 349-50
 SC 77 (Electrochemistry)
 DT J
 CO ZECEAL PY 1968 LA Ger

=> s 14333-24-5 and redox(w)potentials not l8
388 14333-24-5
33790 REDOX
18448 POTENTIALS
910 REDOX(W)POTENTIALS

L9 0 14333-24-5 AND
REDOX(W)POTENTIALS NOT L8

=> s 14333-24-5 and redox(w)potential not l8
388 14333-24-5
33790 REDOX
198044 POTENTIAL
4315 REDOX(W)POTENTIAL

L10 1 14333-24-5 AND
REDOX(W)POTENTIAL NOT L8

=> d l10

L10 ANSWER 1 OF 1
AN CA91(24):201201u
TI ***Redox*** ***potential*** -pH
diagram of the

rhodium-sulfur-water system
AU Kanimov, K. K.; Ogorodnikov, Yu. I.
CS Inst. Metall. Obogashch.
LO Alma-Ata, USSR
SO Deposited Doc., VINITI 2913-78, 14 pp.
Avail. VINITI
SC 72-12 (Electrochemistry)
SX 54, 69
DT T
PY 1978
LA Russ

=> s technetium and redox(w)potential?
7649 TECHNETIUM
33790 REDOX
203416 POTENTIAL?
4627 REDOX(W)POTENTIAL?

L11 15 TECHNETIUM AND
REDOX(W)POTENTIAL?

=> s l11 not l8
L12 15 L11 NOT L8

=> d l12 1-15

L12 ANSWER 1 OF 15
AN CA118(8):72430t
TI Crown thioether chemistry. The first
homoleptic thioether complex
of ***technetium*** and its potential
application in tumor
imaging

AU White, David J.; Kuppers, Heinz Josef;
Edwards, Alison J.; Watkin,
David J.; Cooper, Stephen R.
CS Inorg. Chem. Lab., Univ. Oxford
LO Oxford OX1 3QR, UK
SO Inorg. Chem., 31(26), 5351-2
SC 78-7 (Inorganic Chemicals and Reactions)
SX 8, 72, 75
DT J
CO INOCAJ

IS 0020-1669
PY 1992
LA Eng
OS CJACS

L12 ANSWER 2 OF 15
AN CA116(14):137806a
TI Chemistry of the redox sensitive elements.
Literature review
AU Suter, Daniel
CS Paul Scherrer Inst.
LO CH-5232, Switz.
SO PSI-Ber., 113, 72 pp.
SC 71-0 (Nuclear Technology)
SX 72
DT T
CO PSIBEY
PY 1991
LA Eng

L12 ANSWER 3 OF 15
AN CA113(14):125272y
TI Ligand substitution reactions of
tetrachlorobis(triphenylphosphine)
technetium (IV)
AU Breikss, Anne I.; Davison, Alan; Jones,
Alan G.
CS Dep. Chem., Massachusetts Inst. Technol.
LO Cambridge, MA 02139, USA
SO Inorg. Chim. Acta, 170(1), 75-9
SC 78-7 (Inorganic Chemicals and Reactions)
SX 72
DT J
CO ICHAA3
IS 0020-1693
PY 1990
LA Eng

L12 ANSWER 4 OF 15
AN CA111(4):32594y
TI Chemistry of ***technetium*** complexes
AU Konno, Takumi; Hidaka, Jinsai
CS Inst. Chem., Univ. Tsukuba
LO Ibaraki 305, Japan
SO Kagaku (Kyoto), 44(3), 202-3
SC 78-0 (Inorganic Chemicals and Reactions)
SX 72
DT J
CO KAKYAU
IS 0451-1964
PY 1989
LA Japan

L12 ANSWER 5 OF 15
 AN CA110(18):162359r
 TI Thermodynamic properties of
 technetium (IV) oxides:
 solubilities and the electrode potential of
 the ***technetium***
 (VII)/ ***technetium*** (IV)-oxide couple
 AU Meyer, R. E.; Arnold, W. D.; Case, F. I.;
 O'Kelley, G. D.
 CS Oak Ridge Natl. Lab.
 LO Oak Ridge, TN, USA
 SO Report, ORNL-6480; Order No.
 NUREG/CR-5108, 33 pp. Avail. NTIS
 From: Gov. Rep. Announce. Index (U. S.) 1988,
 88(20), Abstr. No.
 859,865
 SC 72-2 (Electrochemistry)
 SX 68, 69, 71
 DT T
 PY 1988
 LA Eng

L12 ANSWER 6 OF 15
 AN CA109(24):213838k
 TI ***Technetium*** in the hydrosphere and
 in the geosphere. I.
 Chemistry of ***technetium*** and iron in
 natural waters and
 influence of the ***redox***
 potential on the sorption
 of ***technetium***
 AU Lieser, K. H.; Bauscher, C.
 CS Fachber. Anorg. Chem. Kernchem., Tech.
 Hochsch. Darmstadt
 LO Darmstadt D-6100, Fed. Rep. Ger.
 SO Radiochim. Acta, 42(4), 205-13
 SC 53-11 (Mineralogical and Geological
 Chemistry)
 SX 61
 DT J
 CO RAACAP
 IS 0033-8230
 PY 1987
 LA Eng

L12 ANSWER 7 OF 15
 AN CA107(14):123081n
 TI ***Technetium*** electrochemistry. 4.
 Electrochemical and
 spectroelectrochemical studies on the
 bis(tertiary phosphine or
 arsine (D))rhenium(III) complexes, trans-
 [ReD₂X₂]⁺ (X = Cl, Br).
 Comparison with the ***technetium***
 (III) analogues
 AU Kirchhoff, Jon R.; Heineman, William R.;
 Deutsch, Edward
 CS Dep. Chem., Univ. Cincinnati
 LO Cincinnati, OH 45221-0172, USA
 SO Inorg. Chem., 26(19), 3108-13
 SC 72-2 (Electrochemistry)
 SX 73, 78
 DT J
 CO INOCAJ

IS 0020-1669
 PY 1987
 LA Eng
 OS CJACS

L12 ANSWER 8 OF 15
 AN CA103(20):168646j
 TI A spectroelectrochemical study of the
 technetium (IV)/
 technetium (III) couple in bicarbonate
 solutions
 AU Paquette, Jean; Lawrence, Warwick E.
 CS Whiteshell Nucl. Res. Establ., At. Energy
 Canada Ltd.
 LO Pinawa, MB R0E 1L0, Can.
 SO Can. J. Chem., 63(9), 2369-73
 SC 72-2 (Electrochemistry)
 SX 67, 68, 73
 DT J
 CO CJCHAG
 IS 0008-4042
 PY 1985
 LA Eng

L12 ANSWER 9 OF 15
 AN CA103(10):78153s
 TI ***Technetium*** electrochemistry. 3.
 Spectroelectrochemical
 studies on the mixed-ligand
 technetium (III) complexes
 trans-[Tc(PR₂R')₂L]⁺ where L is a
 tetradentate Schiff base ligand
 and PR₂R' is a monodentate tertiary
 phosphine ligand
 AU Ichimura, Akio; Heineman, William R.;
 Deutsch, Edward
 CS Dep. Chem., Univ. Cincinnati
 LO Cincinnati, OH 45221, USA
 SO Inorg. Chem., 24(14), 2134-9
 SC 72-2 (Electrochemistry)
 SX 73, 78
 DT J
 CO INOCAJ
 IS 0020-1669
 PY 1985
 LA Eng
 OS CJACS

L12 ANSWER 10 OF 15
 AN CA101(10):80437q
 TI The behavior of ***technetium*** -99 in
 doped-glass/basalt
 hydrothermal interaction tests
 AU Coles, D. G.; Apted, M. J.
 CS Pac. Northwest Lab.
 LO Richland, WA 99352, USA
 SO Mater. Res. Soc. Symp. Proc., 26(Sci. Basis
 Nucl. Waste Manage. 7),
 129-36
 SC 71-11 (Nuclear Technology)
 SX 53, 57
 DT J
 CO MRSPDH
 IS 0272-9172 PY 1984 LA Eng

L12 ANSWER 11 OF 15
 AN CA100(20):164046d
 TI ***Technetium*** electrochemistry. 2.
 Electrochemical and
 spectroelectrochemical studies of the
 bis(tertiary phosphine) (D)
 complexes trans-[TcIIID₂X₂]⁺ (X =chlorine or
 bromine)
 AU Ichimura, Akio; Heineman, William R.;
 Vanderheyden, Jean Luc;
 Deutsch, Edward
 CS Dep. Chem., Univ. Cincinnati
 LO Cincinnati, OH 45221, USA
 SO Inorg. Chem., 23(9), 1272-8
 SC 72-2 (Electrochemistry)
 SX 8, 73, 78
 DT J
 CO INOCAJ
 IS 0020-1669
 PY 1984
 LA Eng
 OS CJACS

L12 ANSWER 12 OF 15
 AN CA99(6):46958r
 TI Synthesis, characterization, and
 electrochemical properties of
 tertiary diphosphine complexes of
 technetium :
 single-crystal structure of the prototype
 complex
 trans-[Tc(DPPE)₂Br₂]BF₄
 AU Libson, Karen; Barnett, B. L.; Deutsch,
 Edward
 CS Dep. Chem., Univ. Cincinnati
 LO Cincinnati, OH 45221, USA
 SO Inorg. Chem., 22(12), 1695-704
 SC 78-7 (Inorganic Chemicals and Reactions)
 SX 72, 73, 75
 DT J
 CO INOCAJ
 IS 0020-1669
 PY 1983
 LA Eng
 OS CJACS

L12 ANSWER 13 OF 15
 AN CA94(14):111536q
 TI Part I. Carbon and mercury-carbon optically
 transparent electrodes.
 Part II. Investigation of redox properties of
 technetium
 by cyclic voltammetry and thin layer
 spectroelectrochemistry
 AU Hurst, Roger Wilson
 CS Univ. Cincinnati
 LO Cincinnati, OH, USA
 SO 210 pp. Avail. Univ. Microfilms Int.,
 Order No. 8029669
 From: Diss. Abstr. Int. B 1981, 41(7), 2601
 SC 72-11 (Electrochemistry)
 DT D
 PY 1980
 LA Eng

L12 ANSWER 14 OF 15
 AN CA85(10):71471v
 TI Chemistry of trans-
 aquonitrosyltetraamminetechne-
 tium(I) and
 related
 studies
 AU Armstrong, Richard A.; Taube, Henry
 CS Dep. Chem., Stanford Univ.
 LO Stanford, Calif., USA
 SO Inorg. Chem., 15(8), 1904-9
 SC 78-7 (Inorganic Chemicals and Reactions)
 SX 72
 DT J
 CO INOCAJ
 PY 1976
 LA Eng

L12 ANSWER 15 OF 15
 AN CA79(16):100001a
 TI Thiocyanato complexes of
 technetium (IV) and -(V)
 AU Schwochau, K.; Astheimer, L.; Schenk, H.
 J.
 CS Inst. Nuklearchem., Kernforsch. Juelich
 G.m.b.H.
 LO Juelich, Ger.
 SO J. Inorg. Nucl. Chem., 35(7), 2249-57
 SC 78-7 (Inorganic Chemicals and Reactions)
 SX 70
 DT J
 CO JINCAO
 PY 1973
 LA Ger

=> s 14333-24-5
 L13 388 14333-24-5

=> d l13 1-15

L13 ANSWER 1 OF 388
 AN CA118(24):236879z
 TI Polytetraalkylammonium and
 polytrialkylamine-containing ligands
 bonded to inorganic supports for removing and
 concentrating ions
 from solutions
 AU Bruening, Ron; Tarbet, Bryon J.
 CS Brigham Young University
 LO USA
 SO Eur. Pat. Appl., 14 pp.
 PI EP 480386 A1 15 Apr 1992
 DS R: AT, BE, CH, DE, DK, ES, FR, GB, IT, LI,
 LU, NL, SE
 AI EP 91-117160 8 Oct 1991
 PRAI US 90-595309 10 Oct 1990
 IC ICM B01J045-00
 ICS B01J020-32; B01J041-04; B01J041-14
 SC 48-1 (Unit Operations and Processes)
 DT P
 CO EPXXDW
 PY 1992
 LA Eng

L13 ANSWER 2 OF 388
 AN CA118(22):215319b
 TI Highly selective monoalkylene glycol catalysts
 AU Forkner, Matthew William
 CS Union Carbide Chemicals and Plastics Technology Corp.
 LO USA
 SO Eur. Pat. Appl., 17 pp.
 PI EP 529726 A1 3 Mar 1993
 DS R: BE, DE, ES, FR, GB, IT, NL
 AI EP 92-202570 21 Aug 1992
 PRAI US 91-749332 23 Aug 1991
 IC ICM C07C029-10
 ICS C07C031-20
 SC 45-4 (Industrial Organic Chemicals, Leather, Fats, and Waxes)
 SX 67
 DT P
 CO EPXXDW
 PY 1993
 LA Eng

L13 ANSWER 3 OF 388
 AN CA118(18):176907v
 TI Correlation parameters for predicting anion-exchange extraction constants for 287 extraction systems containing 236 different anions on an ES computer with the program OPAG2
 AU Mezhev, E. A.; Reymarov, G. A.; Khananishvili, N. L.; Schmidt, V. S.
 LO Russia
 SO Radiokhimiya, 34(1), 9-50
 SC 68-2 (Phase Equilibriums, Chemical Equilibriums, and Solutions)
 SX 20, 48, 54
 DT J
 CO RADKAU
 IS 0033-8311
 PY 1992
 LA Russ

L13 ANSWER 4 OF 388
 AN CA118(16):157019r
 TI Raman spectra, absolute Raman intensities, and electrooptical parameters of pertechnetate, perrhenate, and periodate ions in aqueous solution
 AU Eysel, Hans H.; Kanellakopulos, Basil
 CS Anorg.-Chem. Inst., Univ. Heidelberg
 LO Heidelberg 6900/1, Germany
 SO J. Raman Spectrosc., 24(2), 119-22
 SC 73-3 (Optical, Electron, and Mass Spectroscopy and Other Related Properties)
 SX 78
 DT J
 CO JRSPAF
 IS 0377-0486
 PY 1993
 LA Eng

L13 ANSWER 5 OF 388
 AN CA118(4):27719h
 TI Ab initio study of the oxides of rhenium and their anions
 AU Boehm, Randall C.; Banerjee, Ajit
 CS Theory Proj., Chem. Sci., Idaho Natl. Eng. Lab., E G and G of Idaho, Inc. P.O. Box 1625
 LO Idaho Falls, ID 83415-2208, USA
 SO Chem. Phys., 167(3), 291-7
 SC 65-5 (General Physical Chemistry)
 DT J
 CO CMPHC2
 IS 0301-0104
 PY 1992
 LA Eng

L13 ANSWER 6 OF 388
 AN CA118(2):12320x
 TI Studies on the extraction of perrhenate by use of crown ethers
 AU Jewad, S. K.; Al-Murab, S. R.; Jalhoom, M. G.
 CS Coll. Educ., Univ. Baghdad
 LO Baghdad, Iraq
 SO Process Metall., 7A(Solvent Extr. 1990, Pt. A), 907-11
 SC 68-2 (Phase Equilibriums, Chemical Equilibriums, and Solutions)
 SX 69
 DT J
 CO PMETEQ
 PY 1992
 LA Eng

L13 ANSWER 7 OF 388
 AN CA117(25):247582c
 TI Interaction of porcine uterine fluid purple acid phosphatase with vanadate and vanadyl cation
 AU Crans, Debbie C.; Simone, Carmen M.; Holz, Richard C.; Que, Lawrence, Jr.
 CS Dep. Chem., Colorado State Univ.
 LO Fort Collins, CO 80523, USA
 SO Biochemistry, 31(47), 11731-9
 SC 7-3 (Enzymes)
 DT J
 CO BICHAU
 IS 0006-2960
 PY 1992
 LA Eng
 OS CJACS

L13 ANSWER 8 OF 388
 AN CA117(8):79005w
 TI Vibrational spectra and local symmetry of
 impurity tetrahedral
 anions of perrhenate(ReO_4^-) in cesium
 halide crystals
 AU Glinka, Yu. D.; Govorun, D. N.;
 Kushnirenko, I. Ya.; Kumeskii, V. R.
 CS Kiev. Gos. Univ.
 LO Kiev, Ukraine
 SO Zh. Prikl. Spektrosk., 56(5-6), 757-62
 SC 73-3 (Optical, Electron, and Mass
 Spectroscopy and Other Related
 Properties)
 DT J
 CO ZPSBAX
 IS 0514-7506
 PY 1992
 LA Russ

L13 ANSWER 9 OF 388
 AN CA116(20):206729s
 TI Extraction and adsorption of chloro
 complexes, perrhenate (ReO_4^-),
 and tetrafluoroborate (BF_4^-) with crown
 ethers and a crown ether
 polymer
 AU Onishi, Hiroshi; Koshima, Hideko
 CS Dep. Chem., Univ. Tsukuba
 LO Tsukuba 305, Japan
 SO Anal. Sci., 7(Suppl., Proc. Int. Congr. Anal.
 Sci., 1991, Pt. 1),
 45-6
 SC 79-0 (Inorganic Analytical Chemistry)
 SX 68
 DT J
 CO ANSCEN
 IS 0910-6340
 PY 1991
 LA Eng

L13 ANSWER 10 OF 388
 AN CA116(19):194575y
 TI The synthesis of high oxidation state metal
 complexes containing the
 tripodal ligand $[(\eta^5\text{-C}_5\text{H}_5)\text{Co}\{\text{P}(\text{OMe})_2(\text{O})\}_3]$ - and the x-ray
 crystal structure of the cobalt-rhenium
 complex $[(\eta^5\text{-C}_5\text{H}_5)\text{Co}\{\text{P}(\text{OMe})_2(\text{O})\}_3\text{ReO}_3]$. [Erratum to
 document cited in
 CA114(7):62334t]
 AU Banbery, Hilary J.; Hussain, Wasif;
 Evans, Iona G.; Hamor, Thomas
 A.; Jones, Christopher J.; McCleverty, Jon A.;
 Schulte, Heinz Josef;
 Engels, Birgit; Kläui, Wolfgang
 CS Sch. Chem., Univ. Birmingham
 LO Edgbaston/Birmingham B15 2TT, UK
 SO Polyhedron, 11(3), 393
 SC 29-13 (Organometallic and
 Organometalloidal Compounds)
 SX 75
 DT J

CO PLYHDE
 IS 0277-5387
 PY 1992
 LA Eng

L13 ANSWER 11 OF 388
 AN CA116(16):165305e
 TI Film-type perrhenate-selective electrode
 AU Mansurov, M. M.; Urmanov, E. G.;
 Semenova, G. L.; Lugovenko, A. N.
 CS Tadzh. State Univ.
 LO Dushanbe, USSR
 SO Zh. Anal. Khim., 46(7), 1325-9
 SC 79-6 (Inorganic Analytical Chemistry)
 SX 72
 DT J
 CO ZAKHA8
 IS 0044-4502
 PY 1991
 LA Russ

L13 ANSWER 12 OF 388
 AN CA116(16):163040r
 TI Generation of the pretilt angles in nematic
 liquid crystal (5CB)
 aligned on the rubbed polypyrrole films
 AU Seo, Dae Shik; Kobayashi, Shunsuke;
 Mochizuki, Akihiro
 CS Grad. Sch. Technol., Tokyo Univ. Agric.
 Technol.
 LO Koganei 184, Japan
 SO Appl. Phys. Lett., 60(8), 1025-6
 SC 75-11 (Crystallography and Liquid
 Crystals)
 DT J
 CO APPLAB
 IS 0003-6951
 PY 1992
 LA Eng

L13 ANSWER 13 OF 388
 AN CA116(16):160183d
 TI Method of estimation of the enthalpy of
 formation and free enthalpy
 of formation of inorganic compounds
 AU Ducros, M.; Sannier, H.
 CS Groupe Rech. Combust. Thermochim., Ec.
 Natl. Super. Tech. Av.
 LO Palaiseau 91120, Fr.
 SO Thermochim. Acta, 196(1), 27-43
 SC 69-2 (Thermodynamics, Thermochemistry,
 and Thermal Properties)
 DT J
 CO THACAS
 IS 0040-6031
 PY 1992
 LA Fr

L13 ANSWER 14 OF 388
 AN CA116(7):57330a
 TI Method and kit for radiolabeling
 monovalent antibody fragments and
 other proteins
 AU Chang, Chien Hsing; Jones, Anastasia
 Lentine
 CS Immunomedics, Inc.
 LO USA
 SO PCT Int. Appl., 25 pp.
 PI WO 9117440 A1 14 Nov 1991
 DS W: AT, AU, BB, BG, BR, CA, CH, DE, DK,
 ES, FI, GB, HU, JP, KP, KR,
 LK, LU, MC, MG, MW, NL, NO, RO, SD,
 SE, SU
 RW: AT, BE, BJ, CF, CG, CH, CM, DE, DK,
 ES, FR, GA, GB, GR, IT, LU,
 ML, MR, NL, SE, SN, TD, TG
 AI WO 91-US1326 5 Mar 1991
 PRAI US 90-518707 7 May 1990
 IC ICM G01N033-534
 ICS G01N033-563; C07K003-28; C07K015-06
 SC 15-1 (Immunochemistry)
 SX 9
 DT P
 CO PIXXD2
 PY 1991
 LA Eng

L13 ANSWER 15 OF 388
 AN CA116(6):50421x
 TI Potentiometric determination of
 perrhenates in products from
 synthesis of rhenium carbonyls
 AU Ranskii, A. P.; Bovykin, B. A.; Shram, V.
 P.; Gritsayuk, S. N.;
 Artyukhova, E. P.; Kolyada, V. I.;
 Shtemenko, A. V.
 LO USSR
 SO Vopr. Khim. Khim. Tekhnol., 93, 25-8
 SC 79-6 (Inorganic Analytical Chemistry)
 DT J
 CO VKKCAJ
 IS 0321-4095
 PY 1990
 LA Russ

=> s 14333-20-1
 L14 308 14333-20-1

=> d l14 1-15

L14 ANSWER 1 OF 308
 AN CA118(24):236879z
 TI Polytetraalkylammonium and
 polytrialkylamine-containing ligands
 bonded to inorganic supports for removing and
 concentrating ions
 from solutions
 AU Bruening, Ron; Tarbet, Bryon J.
 CS Brigham Young University
 LO USA
 SO Eur. Pat. Appl., 14 pp.
 PI EP 480386 A1 15 Apr 1992

DS R: AT, BE, CH, DE, DK, ES, FR, GB, IT, LI,
 LU, NL, SE
 AI EP 91-117160 8 Oct 1991
 PRAI US 90-595309 10 Oct 1990
 IC ICM B01J045-00
 ICS B01J020-32; B01J041-04; B01J041-14
 SC 48-1 (Unit Operations and Processes)
 DT P
 CO EPXXDW
 PY 1992
 LA Eng

L14 ANSWER 2 OF 308
 AN CA118(20):199940q
 TI Anion retention in soil: possible application
 to reduce migration of
 buried technetium and iodine: a review
 AU Gu, B.; Schulz, R. K.
 CS Dep. Soil Sci., Univ. California
 LO Berkeley, CA, USA
 SO Report, NUREG/CR-5464, 33 pp. Avail.
 NTIS
 From: Energy Res. Abstr. 1992, 17(2), Abstr.
 No. 4907
 SC 71-0 (Nuclear Technology)
 SX 19
 DT T
 PY 1991
 LA Eng

L14 ANSWER 3 OF 308
 AN CA118(18):176907v
 TI Correlation parameters for predicting
 anion-exchange extraction
 constants for 287 extraction systems
 containing 236 different anions
 on an ES computer with the program OPAG2
 AU Mezhev, E. A.; Reymarov, G. A.;
 Khananishvili, N. L.; Schmidt, V. S.
 LO Russia
 SO Radiokhimiya, 34(1), 9-50
 SC 68-2 (Phase Equilibriums, Chemical
 Equilibriums, and Solutions)
 SX 20, 48, 54
 DT J
 CO RADKAU
 IS 0033-8311
 PY 1992
 LA Russ

L14 ANSWER 4 OF 308
 AN CA118(16):157019r
 TI Raman spectra, absolute Raman intensities,
 and electrooptical
 parameters of pertechnetate, perrhenate,
 and periodate ions in
 aqueous solution
 AU Eysel, Hans H.; Kanellakopulos, Basil
 CS Anorg.-Chem. Inst., Univ. Heidelberg
 LO Heidelberg 6900/1, Germany
 SO J. Raman Spectrosc., 24(2), 119-22
 SC 73-3 (Optical, Electron, and Mass
 Spectroscopy and Other Related
 Properties)
 SX 78
 DT J
 CO JRSPAF
 IS 0377-0486
 PY 1993
 LA Eng

L14 ANSWER 5 OF 308
 AN CA118(10):93069x
 TI Reactivities of technetium complexes
 AU Omori, Takashi
 CS Sci. Coll., Tohoku Univ.
 LO Sendai, Japan
 SO Kyoto Daigaku Genshiro Jikkensho, [Tech.
 Rep.], KURRI-TR-362, 3-7
 SC 78-0 (Inorganic Chemicals and Reactions)
 SX 67
 DT T
 CO KDGHHDH
 IS 0287-9808
 PY 1991
 LA Japan

L14 ANSWER 6 OF 308
 AN CA118(8):68680g
 TI Technetium-99 removal from process
 solutions and contaminated
 groundwater
 AU Del Cul, G. D.; Bostick, W. D.; Trotter, D.
 R.; Osborne, P. E.
 CS Dep. Chem., Oak Ridge K-25 Site
 LO Oak Ridge, TN 37831-7274, USA
 SO Sep. Sci. Technol., 28(1-3), 551-64
 SC 71-11 (Nuclear Technology)
 SX 61, 66
 DT J
 CO SSTEDS
 IS 0149-6395
 PY 1993
 LA Eng

L14 ANSWER 7 OF 308
 AN CA118(6):47723h
 TI Adsorption of technetium from acidic
 solutions
 AU Ito, K.
 CS Tohoku Univ.
 LO Sendai, Japan
 SO Kyoto Daigaku Genshiro Jikkensho, [Tech.
 Rep.], KURRI-TR-362, 60-5

SC 71-11 (Nuclear Technology)
 SX 66
 DT T
 CO KDGHHDH
 IS 0287-9808
 PY 1991
 LA Japan

L14 ANSWER 8 OF 308
 AN CA118(6):47585q
 TI Nuclear reactions of technetium with
 possible availability and new
 approach to technetium analysis by laser
 photoacoustic spectroscopy
 AU Yoshihara, K.
 CS Sci. Coll., Tohoku Univ.
 LO Sendai, Japan
 SO Kyoto Daigaku Genshiro Jikkensho, [Tech.
 Rep.], KURRI-TR-362, 42-3
 SC 71-6 (Nuclear Technology)
 SX 70, 73, 79
 DT T
 CO KDGHHDH
 IS 0287-9808
 PY 1991
 LA Japan

L14 ANSWER 9 OF 308
 AN CA118(6):47351k
 TI The solution chemistry of technetium on the
 radioactive waste
 disposal
 AU Kanno, T.
 CS Tohoku Univ.
 LO Sendai, Japan
 SO Kyoto Daigaku Genshiro Jikkensho, [Tech.
 Rep.], KURRI-TR-362, 50-9
 SC 71-0 (Nuclear Technology)
 SX 53, 66
 DT T
 CO KDGHHDH
 IS 0287-9808
 PY 1991
 LA Japan

L14 ANSWER 10 OF 308
 AN CA117(18):178285u
 TI The determination of charge of anionic
 technetium-99m
 radiopharmaceuticals
 AU Nowotnik, D. P.; Riley, A. L. M.
 CS Amersham Int. plc
 LO Amersham HP7 9LL, UK
 SO J. Liq. Chromatogr., 15(12), 2165-74
 SC 63-8 (Pharmaceuticals)
 SX 8
 DT J
 CO JLCHD8
 IS 0148-3919
 PY 1992
 LA Eng

L14 ANSWER 11 OF 308
 AN CA117(12):120214d
 TI The behavior of decomposition products of hydrazine in PUREX process
 AU Zil'berman, B. Ya.; Lelyuk, G. A.; Mashkin, A. N.; Fedorov, Yu. S.
 CS V.G. Khlopin Radium Inst.
 LO Leningrad 197022, USSR
 SO Process Metall., 7A(Solvent Extr. 1990, Pt. A), 759-64
 SC 71-5 (Nuclear Technology)
 DT J
 CO PMETEQ
 PY 1992
 LA Eng

L14 ANSWER 12 OF 308
 AN CA117(10):99422h
 TI Behavior of pertechnetate ion adsorption from aqueous solutions shown by activated carbons derived from different sources
 AU Ito, Katsuo; Yachidate, Akira
 CS Res. Inst. Miner. Dress. Metall., Tohoku Univ.
 LO Sendai 980, Japan
 SO Carbon, 30(5), 767-71
 SC 71-11 (Nuclear Technology)
 DT J
 CO CRBNAH
 IS 0008-6223
 PY 1992
 LA Eng

L14 ANSWER 13 OF 308
 AN CA117(10):99416j
 TI Characterization of grouted low-level waste to support performance assessment
 AU Serne, R. J.; Lokken, R. O.; Criscenti, L. J.
 CS Pac. Northwest Lab.
 LO Richland, WA, USA
 SO Waste Manage. (N. Y.), 12(2-3), 271-87
 SC 71-11 (Nuclear Technology)
 SX 58
 DT J
 CO WAMAE2
 IS 0956-053X
 PY 1992
 LA Eng

L14 ANSWER 14 OF 308
 AN CA117(6):56964u
 TI Aqueous partial molar heat capacities and volumes for sodium pertechnetate and sodium perrhenate
 AU Lemire, R. J.; Saluja, P. P. S.; Campbell, A. B.
 CS Res. Chem. Branch, AECL Res.
 LO Pinawa, MB R0E 1L0, Can.
 SO J. Solution Chem., 21(6), 507-23
 SC 69-2 (Thermodynamics, Thermochemistry, and Thermal Properties)
 SX 68, 71

DT J
 CO JSLCAG
 IS 0095-9782
 PY 1992
 LA Eng

L14 ANSWER 15 OF 308
 AN CA116(19):194575y
 TI The synthesis of high oxidation state metal complexes containing the tripodal ligand [(eta.5-C5H5)Co{P(OMe)2(O)}3]- and the x-ray crystal structure of the cobalt-rhenium complex [(eta.5-C5H5)Co{P(OMe)2(O)}3ReO3]. [Erratum to document cited in CA114(7):62334t]
 AU Banbery, Hilary J.; Hussain, Wasif; Evans, Iona G.; Hamor, Thomas A.; Jones, Christopher J.; McCleverty, Jon A.; Schulte, Heinz Josef; Engels, Birgit; Kläui, Wolfgang
 CS Sch. Chem., Univ. Birmingham
 LO Edgbaston/Birmingham B15 2TT, UK
 SO Polyhedron, 11(3), 393
 SC 29-13 (Organometallic and Organometalloidal Compounds)
 SX 75
 DT J
 CO PLYHDE
 IS 0277-5387
 PY 1992
 LA Eng

=> d 114 16-30

L14 ANSWER 16 OF 308
 AN CA116(10):98499f
 TI Rapid and sensitive determination of pertechnetate in molybdenum-99/metastable technetium-99 generator eluates by reversed-phase high-performance liquid chromatography
 AU Amano, R.
 CS Sch. Allied Med. Prof., Kanazawa Univ.
 LO Kanazawa 920, Japan
 SO J. Radioanal. Nucl. Chem., 152(1), 81-6
 SC 79-6 (Inorganic Analytical Chemistry)
 SX 64
 DT J
 CO JRNCMD
 IS 0236-5731
 PY 1991
 LA Eng

L14 ANSWER 17 OF 308
 AN CA116(10):93591v
 TI On the interaction of granite with technetium(IV) and technetium(VII) in aqueous solution
 AU Eriksen, Trygve E.; Cui, Daqing
 CS Dep. Nucl. Chem., R. Inst. Technol.
 LO Stockholm, Swed.
 SO SKB Tech. Rep., 91-47, 36 pp.
 SC 71-11 (Nuclear Technology)
 SX 68
 DT T
 CO STRPEP
 IS 0284-3757
 PY 1991
 LA Eng

L14 ANSWER 18 OF 308
 AN CA116(9):83167x
 TI Synthesis of a new class of technetium chelating agents: N2S2 monoaminemonoamide (MAMA) ligands
 AU Gustavson, Linda M.; Rao, T. N.; Jones, David S.; Fritzberg, Alan R.; Srinivasan, Ananthachari
 CS NeoRx Corp.
 LO Seattle, WA 98119, USA
 SO Tetrahedron Lett., 32(40), 5485-8
 SC 23-8 (Aliphatic Compounds)
 DT J
 CO TELEAY
 IS 0040-4039
 PY 1991
 LA Eng
 OS CASREACT 116:83167

L14 ANSWER 19 OF 308
 AN CA116(8):70103y
 TI Solute transport benchmark studies for TRACR3D code verification
 AU Thomas, T. R.
 CS Westinghouse Idaho Nucl. Co., Inc.
 LO Idaho Falls, ID, USA
 SO Report, WINCO-1083; Order No. DE91008918, 45 pp. Avail. NTIS
 From: Energy Res. Abstr. 1991, 16(5), Abstr. No. 12549
 SC 71-11 (Nuclear Technology)
 SX 53
 DT T
 PY 1991
 LA Eng

L14 ANSWER 20 OF 308
 AN CA116(7):57330a
 TI Method and kit for radiolabeling monovalent antibody fragments and other proteins
 AU Chang, Chien Hsing; Jones, Anastasia Lentine
 CS Immunomedics, Inc.
 LO USA
 SO PCT Int. Appl., 25 pp.
 PI WO 9117440 A1 14 Nov 1991

DS W: AT, AU, BB, BG, BR, CA, CH, DE, DK, ES, FI, GB, HU, JP, KP, KR, LK, LU, MC, MG, MW, NL, NO, RO, SD, SE, SU
 RW: AT, BE, BJ, CF, CG, CH, CM, DE, DK, ES, FR, GA, GB, GR, IT, LU, ML, MR, NL, SE, SN, TD, TG
 AI WO 91-US1326 5 Mar 1991
 PRAI US 90-518707 7 May 1990
 IC ICM G01N033-534
 ICS G01N033-563; C07K003-28; C07K015-06
 SC 15-1 (Immunochemistry)
 SX 9
 DT P
 CO PIXXD2
 PY 1991
 LA Eng

L14 ANSWER 21 OF 308
 AN CA116(6):46984r
 TI Adsorption of pertechnetate ion on active carbon from acids and their salt solutions
 AU Ito, K.; Akiba, K.
 CS Res. Inst. Miner. Dressing and Metall., Tohoku Univ.
 LO Sendai 980, Japan
 SO J. Radioanal. Nucl. Chem., 152(2), 381-90
 SC 66-4 (Surface Chemistry and Colloids)
 SX 71
 DT J
 CO JRNCMD
 IS 0236-5731
 PY 1991
 LA Eng

L14 ANSWER 22 OF 308
 AN CA115(22):242375m
 TI The electrode potential of the technetium(IV)-technetium(VII) couple
 AU Meyer, R. E.; Arnold, W. D.
 CS Oak Ridge Natl. Lab.
 LO Oak Ridge, TN 37831-6201, USA
 SO Radiochim. Acta, 55(1), 19-22
 SC 72-2 (Electrochemistry)
 DT J
 CO RAACAP
 IS 0033-8230
 PY 1991 LA Eng

L14 ANSWER 23 OF 308
 AN CA115(12):122178c
 TI Migration of radionuclides in fracture columns
 AU Holtta, Pirkko; Hakanen, Martti; Hautajarvi, Aimo
 CS Dep. Radiochem., Univ. Helsinki
 LO Helsinki SF-00170, Finland
 SO Mater. Res. Soc. Symp. Proc., 212(Sci. Basis Nucl. Waste Manage. 14), 669-76
 SC 71-11 (Nuclear Technology) SX 53
 DT J CO MRSPDH IS 0272-9172
 PY 1991 LA Eng

L14 ANSWER 24 OF 308
 AN CA115(9):88306f
 TI Determination of isoenzymes
 AU Abbott, William A.
 CS Abbott Laboratories
 LO USA
 SO Eur. Pat. Appl., 24 pp.
 PI EP 401641 A2 12 Dec 1990
 DS R: AT, BE, CH, DE, ES, FR, GB, IT, LI, NL
 AI EP 90-110104 28 May 1990
 PRAI US 89-364400 9 Jun 1989
 IC ICM C12Q001-00
 ICS C12Q001-32; C12Q001-50; C12Q001-42;
 C12Q001-52
 SC 7-1 (Enzymes)
 DT P
 CO EPXXDW
 PY 1990
 LA Eng

L14 ANSWER 25 OF 308
 AN CA115(8):80633q
 TI Site and safety studies of the Asse Salt
 Mine and engineering
 developments
 AU Bode, W.; Hensel, G.; Hente, B.; Herbert,
 H. J.; Reichelt, C.;
 Sander, W.; Starke, C.; Grisseman, C.
 CS Inst. Tieflagerung, GSF-Forschungszent.
 Umwelt und Gesundheit
 G.m.b.H.
 LO Neuherberg D-8042, Fed. Rep. Ger.
 SO GSF-Ber., 31/90, 101 pp.
 SC 71-11 (Nuclear Technology)
 DT T
 CO GSFBE M
 IS 0721-1694
 PY 1991
 LA Ger

L14 ANSWER 26 OF 308
 AN CA115(3):26033f
 TI Rapid uptake of technetium-99m
 pertechnetate ($^{99m}\text{TcO}_4^-$) by several
 plants
 AU Amano, Ryohei; Ando, Atsushi; Hiraki,
 Tatsunosuke; Mori, Hirofumi;
 Matsuda, Hiroshi; Hisada, Kinichi
 CS Sch. Allied Med. Prof., Kanazawa Univ.
 LO Kanazawa 920, Japan
 SO Radioisotopes, 39(12), 585-6
 SC 11-2 (Plant Biochemistry)
 DT J
 CO RAISAB
 IS 0033-8303
 PY 1990
 LA Eng

L14 ANSWER 27 OF 308
 AN CA115(3):25786s
 TI Technetium uptake by the green alga
 Chlorella fusca
 AU Mueller, H.; Ter Meer-Bekk, C.
 CS Inst. Inorg. Anal. Chem., Univ. Freiburg

LO Freiburg D-7800, Fed. Rep. Ger.
 SO J. Radioanal. Nucl. Chem., 154(1), 37-9
 SC 10-2 (Microbial Biochemistry)
 SX 11
 DT J
 CO JRNC DM
 IS 0236-5731
 PY 1991
 LA Eng

L14 ANSWER 28 OF 308
 AN CA114(24):236425r
 TI Diffusion of americium, plutonium, uranium,
 neptunium, cesium,
 iodine, and technetium in compacted sand-
 bentonite mixture
 AU Albinsson, Yngve; Engkvist, Ingemar
 CS Dep. Nucl. Chem., Chalmers Univ.
 Technol.
 LO Goeteborg S-412 96, Swed.
 SO Radioact. Waste Manage. Nucl. Fuel
 Cycle, 15(4), 221-39
 SC 71-11 (Nuclear Technology)
 DT J
 CO RWMCD4
 IS 0739-5876
 PY 1991
 LA Eng

L14 ANSWER 29 OF 308
 AN CA114(14):131370r
 TI A technetium rejection flowsheet
 AU Baker, R.; Miles, J. H.; Roberts, P. T.
 CS Process Serv. Div., AEA Fuel Serv.
 LO Harwell/Oxon OX11 0RA, UK
 SO Inst. Chem. Eng. Symp. Ser., 119(Extraction
 '90), 213-19
 SC 71-5 (Nuclear Technology)
 DT J
 CO ICESDB
 IS 0307-0492
 PY 1990
 LA Eng

L14 ANSWER 30 OF 308
 AN CA114(9):77949w
 TI Novel technetium-99m complexes for
 radiopharmaceutical imaging
 agents
 AU Dunn, T. Jeffrey; Nosco, Dennis; Woulfe,
 Steven; Dean, Richard;
 Wester, Dennis
 CS Mallinckrodt, Inc.
 LO USA
 SO PCT Int. Appl., 119 pp.
 PI WO 9000854 A1 8 Feb 1990
 DS W: AU, JP
 RW: AT, BE, CH, DE, FR, GB, IT, LU, NL, SE
 AI WO 89-US3066 18 Jul 1989
 PRAI US 88-221099 19 Jul 1988
 US 89-315168 24 Feb 1989
 IC ICM C07F013-00
 ICS A61K049-02; C07C251-24; C07C217-48;
 C07C215-50; C07C251-08;
 C07F005-04; C07F009-50
 SC 8-9 (Radiation Biochemistry)
 SX 25, 78
 DT P
 CO PIXXD2
 PY 1990
 LA Eng
 OS MARPAT 114:77949

=> s 14333-20-1 and environment?
 308 14333-20-1
 75860 ENVIRONMENT?
 L7 1 14333-20-1 AND ENVIRONMENT?

=> d 17

L7 ANSWER 1 OF 1
 AN CA111(24):220568s
 TI The chemical speciation of technetium in
 the ***environment***
 A literature survey
 AU Sparkes, S. T.; Long, S. E.
 CS Environ. Med. Sci. Div., Harwell Lab.
 LO Oxfordshire OX11 0RA, UK
 SO U. K. At. Energy Auth., Harwell Lab.,
 [Rep.] AERE-R, AERE R 12743,
 32 pp.
 SC 71-0 (Nuclear Technology)
 DT T
 CO UKRGAL
 IS 0436-9734
 PY 1988
 LA Eng

=> s 14333-20-1 and separat?
 308 14333-20-1
 95976 SEPARAT?
 L8 12 14333-20-1 AND SEPARAT?

=> d 18 ti,au,so,py

L8 ANSWER 1 OF 12
 TI ***Separation*** of anionic and cationic
 compounds of biomedical

interest by high-performance liquid
 chromatography on porous
 graphitic carbon
 AU Gu, Guanghua; Lim, C. K.
 SO J. Chromatogr., 515, 183-92
 PY 1990

=> d 18 2-12 ti,au,so,py

L8 ANSWER 2 OF 12
 TI ***Separation*** of the noble metals
 ruthenium and palladium
 from a nitric acid solution of a nuclear fuel
 reprocessing stream
 containing complexing agents
 AU Ghafourian, Hossein
 SO Kernforschungscent. Karlsruhe, [Ber.] KfK,
 KfK 4568, 125 pp.
 PY 1989

L8 ANSWER 3 OF 12
 TI Electronic interaction chromatography on
 porous graphitic carbon.
 Separation of [99mTc]pertechnetate
 and perhenate anions
 AU Lim, C. K.
 SO Biomed. Chromatogr., 3(2), 92-3
 PY 1989

L8 ANSWER 4 OF 12
 TI ***Separation*** of radionuclides from
 water by magnesium oxide
 adsorption
 AU Tseng, Chia Lian; Lo, Jem Mau; Yeh, Si
 Jung
 SO Anal. Sci., 3(5), 437-40
 PY 1987

L8 ANSWER 5 OF 12
 TI Silica gel supported microcrystalline
 zirconium phosphate ion
 exchanger (Si-ZrP) and its application in
 chemical
 separations . III. ***Separation***
 of alkali and
 transition metal ions
 AU Le Van So; Szirtes, L.
 SO J. Radioanal. Nucl. Chem., 99(1), 55-60
 PY 1986

L8 ANSWER 6 OF 12
 TI ***Separation*** of uranium from
 technetium in recovery of spent
 nuclear fuel
 AU Friedman, Horace A.
 SO U.S., 4 pp.
 PY 1985

L8 ANSWER 7 OF 12

TI Ion-exchange ***separation*** and preparation of metallic technetium

AU Spitsyn, V. I.; Kuzina, A. F.; Oblova, A. A.; Tsarenko, A. F.

SO Poluch. i Vydelenie Radioaktiv. Izotopov, Tashkent 105-9

From: Ref. Zh., Khim. 1984, Abstr. No. 5B4506

PY 1983

L8 ANSWER 8 OF 12

TI Extraction of some single-charged oxo anions by tetraoctylammonium nitrate

AU Dzhigirkhanov, M. A.; Matyunin, Yu. I.

SO Deposited Doc., VINITI 575-82, 365-9 Avail. VINITI

PY 1981

L8 ANSWER 9 OF 12

TI ***Separation*** of technetium(VII) from technetium(IV) by solvent extraction

AU Ianovici, E.; Lerch, P.; Proso, Z.; Maddock, A. G.

SO J. Radioanal. Chem., 46(1), 11-19

PY 1978

L8 ANSWER 10 OF 12

TI ***Separation*** of technetium from fission products by

extraction with trialkyl amines in tetrachloromethane

AU Macasek, Fedor; Rajec, Pavol; Mikulaj, Vladimir; Kopunec, Rudolf;

Cech, Roman

SO Collect. Czech. Chem. Commun., 43(1), 200-8

PY 1978

L8 ANSWER 11 OF 12

TI ***Separation*** of molybdate, pertechnate, iodate, iodide, and ruthenate ions using thin-layer chromatography

AU Makie, Y.; Murakami, Y.

SO Nippon Kagaku Kaishi, No. 1, 85-90

PY 1973

L8 ANSWER 12 OF 12

TI ***Separation*** of molybdate, pertechnate, iodate, iodide, and ruthenate ions using a thin-layer chromatographic method

AU Maki, Yasuyuki; Murakami, Yukio

SO Nippon Kagaku Kaishi, (1), 85-90

PY 1973

=> d l8 8

L8 ANSWER 8 OF 12

AN CA98(16):133078b

TI Extraction of some single-charged oxo anions by tetraoctylammonium nitrate

AU Dzhigirkhanov, M. A.; Matyunin, Yu. I.

CS Khim. Fak., Mosk. Gos. Univ.

LO Moscow, USSR

SO Deposited Doc., VINITI 575-82, 365-9 Avail. VINITI

SC 68-2 (Phase Equilibriums, Chemical Equilibriums, and Solutions)

SX 71

DT T

PY 1981

LA Russ

=> s 14333-20-1 and extract?

308 14333-20-1

85108 EXTRACT?

L9 28 14333-20-1 AND EXTRACT?

=> s l9 not l8

L10 25 L9 NOT L8

=> d l10 1-25 ti,au,so,py

L10 ANSWER 1 OF 25

TI Correlation parameters for predicting anion-exchange

extraction constants for 287 ***extraction*** systems

containing 236 different anions on an ES computer with the program

OPAG2

AU Mezhev, E. A.; Reymarov, G. A.; Khananishvili, N. L.; Schmidt, V. S.

SO Radiokhimiya, 34(1), 9-50

PY 1992

L10 ANSWER 2 OF 25

TI The behavior of decomposition products of hydrazine in PUREX process

AU Zil'berman, B. Ya.; Lelyuk, G. A.; Mashkin, A. N.; Fedorov, Yu. S.

SO Process Metall., 7A(Solvent Extr. 1990, Pt. A), 759-64

PY 1992

L10 ANSWER 3 OF 25

TI ***Extraction*** of pertechnetate anion as a ligand in a

cerium(IV) tributyl phosphate complex

AU Akopov, G. A.; Krinitsyn, A. P.; Tsarenko, A. F.

SO J. Radioanal. Nucl. Chem., 140(2), 349-56

PY 1990

L10 ANSWER 4 OF 25

TI Alkyl and arylphosphonium nitrate salts as ***extractants*** for

pertechnetate

AU Tse, Pui Kwan; Horwitz, E. Philip

SO Solvent Extr. Ion Exch., 8(2), 353-60

PY 1990

L10 ANSWER 5 OF 25

TI Preferential solvation of single ions and the TBP- ***extraction***

behavior of acids, uranyl pertechnetate and uranyl nitrate

AU Kanellakopulos, B.; Neck, V.; Kim, J. I.

SO Radiochim. Acta, 48(3-4), 159-63

PY 1989

L10 ANSWER 6 OF 25

TI Studies on the ***extraction*** of TcO_4^- from solutions of mono-

and bivalent metal hydroxides by use of Kryptofix-22 in

1,2-dichloroethane

AU Jalhoom, Muayed G.

SO Proc. Int. Conf. Sep. Sci. Technol., 2nd, Volume 2, 661-6. Edited

by: Baird, M. H. I.; Vijayan, S. Can. Soc. Chem. Eng.: Ottawa, Ont.

PY 1989

L10 ANSWER 7 OF 25

TI Antimony ***extraction*** from nitric acid solutions by tributyl

phosphate. III. The influence of iodide and pertechnetate ions on

the ***extraction*** of antimony from nitric acid solutions by

tributyl phosphate

AU Lakaev, V. S.; Smelov, V. S.

SO Radiokhimiya, 30(4), 481-4

PY 1988

L10 ANSWER 8 OF 25

TI ***Extraction*** of pertechnetate ions by use of crown ethers

from sulfuric acid solutions

AU Jalhoom, M. G.

SO Radiochim. Acta, 39(4), 195-7

PY 1986

L10 ANSWER 9 OF 25

TI A convenient method on the methyl-ethyl-ketone ***extraction***

of pertechnetate (99mTcO_4^-)

AU Lee, Jong Du; Lee, Byung Hun

SO Pangsason Pango Hakhoechi, 9(2), 103-11

PY 1984

L10 ANSWER 10 OF 25

TI Solubility and ***extraction*** of tetraphenylarsonium

pertechnetate $[(\text{C}_6\text{H}_5)_4\text{AsTcO}_4]$; thermodynamic investigations

AU Neck, V.; Kanellakopulos, B.; Kim, J. I.

SO Kernforschungszent. Karlsruhe, [Ber.] KfK, KfK 3998, 65 pp.

PY 1985

L10 ANSWER 11 OF 25

TI ***Extraction*** of nitric acid, technetium and palladium by

bidentate carbamoylphosphonates

AU Gorski, B.; Kuca, L.; Petrzilova, H.

SO J. Radioanal. Nucl. Chem., 91(2), 305-13

PY 1985

L10 ANSWER 12 OF 25

TI Co- ***extraction*** of pertechnetate with zirconium(IV) in the

TBP-nitric acid system

AU Jassim, T. N.; Persson, G.; Liljenzin, J. O.

SO Solvent Extr. Ion Exch., 2(7-8), 1079-92

PY 1984

L10 ANSWER 13 OF 25

TI ***Extraction*** potential of trialkylsulfonium nitrates

AU Dzhigirkhanov, M. S.; Silant'ev, A. I.

SO Deposited Doc., VINITI 575-82, 370-4 Avail. VINITI

PY 1981

L10 ANSWER 14 OF 25

TI ***Extraction*** of some singly and doubly charged anions by

trialkylsulfonium nitrate

AU Dzhigirkhanov, M. S.; Abramov, A. A.;

Silant'ev, A. I.; Iofa, B. Z.

SO Radiokhimiya, 25(1), 128-30

PY 1983

L10 ANSWER 15 OF 25

TI The modeling of technetium ***extraction*** in uranium cycle of

PUREX-type process

AU Kadrabova, J.; Macasek, F.

SO Acta Fac. Rerum Nat. Univ. Comenianae, Chim., 30, 55-63

PY 1982

L10 ANSWER 16 OF 25

TI Quantitative description using linear relationships of free energies

for a new set of anion-exchange ***extraction*** constants for a

series of single-charged anions

AU Shmidt, V. S.; Rybakov, K. A.; Rubisov, V. N.

SO Zh. Neorg. Khim., 27(6), 1519-22

PY 1982

L10 ANSWER 17 OF 25

TI The ***extraction*** of technetate(VI) ion and palladium(II) by

dihexyl-N,N-

diethylcarbamoylmethylphosphonate from nitric acid

AU McIsaac, L. D.

SO Sep. Sci. Technol., 17(2), 387-405

PY 1982

L10 ANSWER 18 OF 25
 TI ***Extraction*** of pertechnetate, molybdate, and molybdophosphate ions by some oxygen-containing solvents in acid solution: a new procedure of production of technetium-99m for medical use
 AU Misak, N. Z.; El-Asrag, H. A.; El-Kolaly, M.; Hallaba, E.
 SO Microchem. J., 26(3), 316-28
 PY 1981

L10 ANSWER 19 OF 25
 TI Simulation of interfacial two-step consecutive reactions by diffusion in the mass-transfer kinetics of liquid-liquid ***extraction*** of metal cations
 AU Danesi, P. R.; Vandegrift, G. F.; Horwitz, E. P.; Chiarizia, R.
 SO J. Phys. Chem., 84(26), 3582-7
 PY 1980

L10 ANSWER 20 OF 25
 TI ***Extraction*** of pertechnetate anion as a ligand in metal complexes with tributylphosphate
 AU Macasek, F.; Kadrabova, J.
 SO J. Radioanal. Chem., 51(1), 97-106
 PY 1979

L10 ANSWER 21 OF 25
 TI ***Extraction*** of pertechnetate with tri(alkyl)methylammonium nitrates. Kinetics and mechanism in the system o-xylene-nitric acid
 AU Dyrkacz, Gary R.; Vandegrift, G. F.; Thomsen, M. W.; Horwitz, E. P.
 SO J. Phys. Chem., 83(6), 670-5
 PY 1979

L10 ANSWER 22 OF 25
 TI ***Extraction*** of technetium(VII) from nitrate solutions by tri-n-octylamine solutions
 AU Volk, V. I.; Rozen, A. M.; Barabash, A. I.
 SO Radiokhimiya, 18(2), 243-6
 PY 1976

L10 ANSWER 23 OF 25
 TI Organic oxides as ***extractants*** for metal anions
 AU Krasovec, F.; Klotfutar, C.
 SO Solvent Extr. Chem., Proc. Int. Conf., Goteborg, Volume Date 1966
 509-16
 PY 1967

L10 ANSWER 24 OF 25
 TI Properties of anions controlling the ***extractability*** of their associates with triarylmethane dyes
 AU Lomonosov, S. A.; Nikolaev, A. V.

SO Zh. Strukt. Khim., 8(2), 216-20
 PY 1967

L10 ANSWER 25 OF 25
 TI Solvent ***extraction*** and spectrophotometric determination of the pertechnetate ion with Methyl Violet
 AU Fujinaga, Taitiro; Koyama, Mutsuo; Kanchiku, Yoshihiko; Tsurubo, Shigeo
 SO Bull. Chem. Soc. Jpn., 40(4), 817-21
 PY 1967

CAS Online Search, April 1994

CAS Online Search 5/11/94

=> s 14333-24-5 and extract? and 1993-1994/py
 396 14333-24-5
 88662 EXTRACT?
 488590 1993-1994/PY

L1 1 14333-24-5 AND EXTRACT? AND 1993-1994/PY

=> d l1

L1 ANSWER 1 OF 1 CA
 AN CA119(18):189552w CA
 TI Solvent ***extraction*** of rhenium(VII) with crown ethers and some univalent cations
 AU Zhang, Xianxin; Zhou, Zhixian; Ma, Shejun; Shu, Chang
 CS Dep. Chem., Zhengzhou Univ.
 LO Zhengzhou 450052, Peop. Rep. China
 SO Solvent Extr. Ion Exch., 11(4), 585-601
 SC 68-2 (Phase Equilibriums, Chemical Equilibriums, and Solutions)
 SX 69
 DT J
 CO SEIEDB
 IS 0736-6299
 PY 1993
 LA Eng

=> s 14333-20-1 and extract? and 1993-1994/py
not l1

317 14333-20-1
88662 EXTRACT?
488590 1993-1994/PY

L2 1 14333-20-1 AND EXTRACT? AND
1993-1994/PY NOT L1

=> d l2

L2 ANSWER 1 OF 1 CA
AN CA120(6):64219g CA
TI ***Extraction*** of technetium(VII) from
uranium(VI) in nitric
acid system by primary amine - n-heptane
solution
AU Ito, K.
CS Inst. Adv. Mater. Process., Tohoku Univ.
LO Sendai 980, Japan
SO J. Radioanal. Nucl. Chem., 171(2), 371-82
SC 71-5 (Nuclear Technology)
DT J
CO JRNCMD
IS 0236-5731
PY 1993
LA Eng

=> s rhenium and recovery and 1993-1994/py
15500 RHENIUM
101858 RECOVERY
488590 1993-1994/PY

L3 13 RHENIUM AND RECOVERY AND
1993-1994/PY

=> d l3 1-13

L3 ANSWER 1 OF 13 CA
AN CA120(12):146794e CA
TI ***Recovery*** and mutual separation
process of fission-produced
noble metals(II) - dissolution of the
simulated fission-produced
noble metal alloys (molybdenum-
rhenium -ruthenium-rhodium-
palladium alloys) in boiling nitric acid
solution
AU Matsui, Tsuneo; Sasaki, Ryoichi
CS Dep. Nucl. Eng., Nagoya Univ.
LO Nagoya 464-01, Japan
SO Proc. Int. Conf. Technol. Expo. Future Nucl.
Syst.: Emerging Fuel
Cycles Waste Disposal Options, Volume 2,
1018-24. Am. Nucl. Soc.:
La Grange Park, Ill.
SC 71-11 (Nuclear Technology)
SX 56
DT C
CO 59PFAE
PY 1993
LA Eng

L3 ANSWER 2 OF 13 CA
AN CA120(12):142854b CA
TI Wet precipitator case histories

AU Ojanpera, R.; Gamble, B.
CS Joy Technol. Canada Inc.
LO Kitchener, ON N2C 2C8, Can.
SO Mater. Process. Technol. Environ. Prot. Min.
Metall., Proc. Int.
Symp., 457-71. Edited by: Godbehere, P. W.
Can. Inst. Min. Metall.
Pet.: Montreal, Can.
SC 59-4 (Air Pollution and Industrial Hygiene)
SX 47, 54, 56
DT C
CO 59ODA3
PY 1993
LA Eng

L3 ANSWER 3 OF 13 CA
AN CA120(12):139827q CA
TI Advanced materials extraction needed for
new materials production
AU Davidson, Charles F.; Harbuck, Donna D.;
Redden, Lorin D.
CS Salt Lake City Res. Cent., Bur. Mines
LO Salt Lake City, UT 84108, USA
SO Int. Conf. Process. Mater. Prop., 1st, 417-20.
Edited by: Henein,
Hani; Oki, Takeo. Miner. Met. Mater. Soc:
Warrendale, Pa.
SC 54-2 (Extractive Metallurgy)
DT C
CO 59TDAS
PY 1993
LA Eng

L3 ANSWER 4 OF 13 CA
AN CA120(6):59231a CA
TI Process for simultaneous ***recovery*** of
precious metals and
tertiary phosphine from spent catalysts using
tellurium
IN De Oliveira, Bandarra Joao J.; De
Carvalho, Alexandre J. G.; Heggie,
William
PA Plurichemie Anstalt
LO Liechtenstein
SO Can. Pat. Appl., 9 pp.
PI CA 2086384 AA 930701
AI CA 92-2086384 921229
PRAI PT 91-99958 911231
PT 91-99959 911231
SC 54-4 (Extractive Metallurgy)
SX 49, 51
DT P
CO CPXXEB
PY 1993
LA Eng

L3 ANSWER 5 OF 13 CA
 AN CA120(6):57801n CA
 TI ***Recovery*** of ***rhenium*** from
 nonferrous metallurgy
 wastes
 IN Mordalski, Jerzy; Lach, Jan; Szmygin,
 Marian; Banas, Boleslaw;
 Czarny, Joanna; Kowal, Witold
 PA KGHM "Polska miedz" - SA. Oddzial-
 Zaklad Doswiadczalny
 LO Pol.
 SO Pol., 12 pp. Abstracted and indexed from
 the unexamined application.
 PI PL 160950 B1 930531
 AI PL 88-273322 880624
 SC 49-1 (Industrial Inorganic Chemicals)
 SX 55
 DT P
 CO POXXA7
 PY 1993
 LA Pol

L3 ANSWER 6 OF 13 CA
 AN CA120(4):33815u CA
 TI Radiochemical separation of thallium(I)
 using cerium(IV) molybdate
 as an ion exchanger
 AU Bhagat, R. D.; Turel, Z. R.
 CS Nucl. Chem. Div., Inst. Sci.
 LO Bombay 400032, India
 SO Sep. Sci. Technol., 29(5), 663-9
 SC 49-1 (Industrial Inorganic Chemicals)
 SX 66, 68, 71, 78, 79
 DT J
 CO SSTEDS
 IS 0149-6395
 PY 1994
 LA Eng

L3 ANSWER 7 OF 13 CA
 AN CA120(2):22699h CA
 TI A procedural modification for enhanced
 recovery of
 precious metals (gold, platinum group
 elements) following nickel
 sulfide fire assay and tellurium co-
 precipitation: applications for
 analysis of geological samples by inductively
 coupled plasma mass
 spectrometry
 AU Sun, Min; Jain, Jinesh; Zhou, Meifu;
 Kerrich, Robert
 CS Dep. Geol. Sci., Univ. Saskatchewan
 LO Saskatoon, SK S7N 0W0, Can.
 SO Can. J. Appl. Spectrosc., 38(4), 103-8
 SC 79-6 (Inorganic Analytical Chemistry)
 SX 53
 DT J
 CO CJSPEM
 PY 1993
 LA Eng

L3 ANSWER 8 OF 13 CA
 AN CA119(26):275600s CA

TI Reclamation of tungsten from activated
 fusion reactor components
 AU Murphy, D.; Warren, S.; Butterworth, G. J.
 CS Johnson Matthey plc
 LO Royston, Hertfordshire, SG8 5HE, UK
 SO Fusion Eng. Des., 22(4), 379-92
 SC 54-2 (Extractive Metallurgy)
 SX 71
 DT J
 CO FEDEEE
 IS 0920-3796
 PY 1993
 LA Eng

L3 ANSWER 9 OF 13 CA
 AN CA119(18):185191e CA
 TI Geochemical prospecting by selective
 leaching followed by
 quantitative analysis
 IN Clark, John Robert
 LO USA
 SO PCT Int. Appl., 60 pp.
 PI WO 9309223 A1 930513
 DS W: AU, BR, CA, FI, NO, RU
 RW: AT, BE, CH, DE, DK, ES, FR, GB, GR,
 IE, IT, LU, MC, NL, SE
 AI WO 92-US8732 921013
 PRAI US 91-788543 911106
 SC 53-2 (Mineralogical and Geological
 Chemistry)
 DT P
 CO PIXXD2
 PY 1993
 LA Eng

L3 ANSWER 10 OF 13 CA
 AN CA119(16):163796d CA
 TI ***Recovery*** of hydrocarbons from
 contaminated or waste
 petroleum and petroleum products by using a
 surface-treated
 permeable inorganic membrane
 IN Sleppy, William C.; Wieserman, Larry F.;
 Thomas, Kenneth M.;
 Goodboy, Kenneth P.
 PA Aluminum Co. of America
 LO USA
 SO U.S., 8 pp.
 PI US 5209838 A 930511
 AI US 91-772205 911007
 SC 51-2 (Fossil Fuels, Derivatives, and
 Related Products)
 SX 60
 DT P
 CO USXXAM
 PY 1993
 LA Eng

L3 ANSWER 11 OF 13 CA
 AN CA119(2):13368b CA
 TI Inclusions of the .CHI.-phase and structural
 recovery in
 ternary nickel-titanium based alloys
 AU Khundzhua, A. G.; Sorokin, A. V.
 CS Mosk. Gos. Univ.
 LO Moscow, Russia
 SO Izv. Akad. Nauk, Ser. Fiz., 57(2), 117-19
 SC 56-8 (Nonferrous Metals and Alloys)
 DT J
 CO IRAFEO
 PY 1993
 LA Russ

L3 ANSWER 12 OF 13 CA
 AN CA118(26):260509z CA
 TI Metal ***recovery*** from waste
 catalysts used in exhaust gas
 treatment
 IN Giegerich, Heinz; Hensel, Clemens
 PA EAR European Autocat Recycling GmbH
 LO Germany
 SO Ger. Offen., 7 pp.
 PI DE 4122717 A1 930121
 AI DE 91-4122717 910709
 SC 60-4 (Waste Treatment and Disposal)
 SX 51, 54, 59, 67
 DT P
 CO GWXXBX
 PY 1993
 LA Ger

L3 ANSWER 13 OF 13 CA
 AN CA118(22):217007x CA
 TI Selective ***recovery*** of
 rhenium from gas-scrubbing
 solutions of molybdenite roasting using direct
 precipitation and
 separation on resins
 AU Blazy, P.; Jdid, E. A.; Floreancig, A.;
 Mottet, B.
 CS Cent. Recher. sur la Valorisation Miner.,
 ENSG
 LO Vandoeuvre 54501, Fr.
 SO Sep. Sci. Technol., 28(11), 2073-96
 SC 54-2 (Extractive Metallurgy)
 DT J
 CO SSTEDS
 IS 0149-6395
 PY 1993
 LA Eng

=> s technetium and recovery and 1993-1994/py
 8108 TECHNETIUM
 101858 RECOVERY
 488590 1993-1994/PY
 L4 8 TECHNETIUM AND RECOVERY
 AND 1993-1994/PY

=> d l4 1-8

L4 ANSWER 1 OF 8 CA
 AN CA120(16):202710p CA

TI Method and apparatus for concentration and
 purification of
 pertechnetate-99mTc solutions
 IN Seifert, Sepp; Schneider, Frauke; Wagner,
 Gerhard
 PA Forschungszentrum Rossendorf E.V.; Verein
 fuer Kernverfahrenstechnik
 und Analytik E.V.
 LO Germany
 SO Ger. Offen., 5 pp.
 PI DE 4229327 A1 940303
 AI DE 92-4229327 920902
 SC 71-6 (Nuclear Technology)
 DT P
 CO GWXXBX
 PY 1994
 LA Ger

L4 ANSWER 2 OF 8 CA
 AN CA120(16):202625q CA
 TI ***Recovery*** of ***technetium***
 from high-level liquid
 waste generated in nuclear fuel reprocessing
 AU Kubota, Masumitsu
 CS Dep. Chem. Fuel Res., Japan At. Energy
 Res. Inst.
 LO Tokai 319-11, Japan
 SO Radiochim. Acta, 63, 91-6
 SC 71-11 (Nuclear Technology)
 DT J
 CO RAACAP
 IS 0033-8230
 PY 1993
 LA Eng

L4 ANSWER 3 OF 8 CA
 AN CA120(12):146804h CA
 TI Advanced chemical separations in support
 of the Clean Option
 Strategy
 AU Horwitz, E. Philip; Dietz, Mark L.;
 Diamond, Herbert; Rogers, Robin
 D.; Leonard, Ralph A.
 CS Chem. Div., Argonne Natl. Lab.
 LO Argonne, IL 60439-4831, USA
 SO Proc. Int. Conf. Technol. Expo. Future Nucl.
 Syst.: Emerging Fuel
 Cycles Waste Disposal Options, Volume 1,
 39-43. Am. Nucl. Soc.: La
 Grange Park, Ill.
 SC 71-11 (Nuclear Technology)
 DT C
 CO 59PFAE
 PY 1993
 LA Eng

L4 ANSWER 4 OF 8 CA
 AN CA120(2):17401a CA
 TI Production of fission-product molybdenum
 from irradiated
 low-enriched uranium for use in nuclear
 medicine
 AU Sameh, A. A.
 CS HZY
 LO Germany
 SO KFK-Nachr., 25(2), 83-9
 SC 71-6 (Nuclear Technology)
 DT J
 CO KFKNAW
 IS 0340-756X
 PY 1993
 LA Ger

L4 ANSWER 5 OF 8 CA
 AN CA119(24):258292a CA
 TI Separation and ***recovery*** of Tc from
 radioactive waste
 solutions
 IN Imoto, Yoshe; Mikura, Michitaka
 PA Tokyo Shibaura Electric Co
 LO Japan
 SO Jpn. Kokai Tokkyo Koho, 10 pp.
 PI JP 05100085 A2 930423 Heisei
 AI JP 91-259144 911007
 SC 71-11 (Nuclear Technology)
 DT P
 CO JKXXAF
 PY 1993
 LA Japan

L4 ANSWER 6 OF 8 CA
 AN CA119(20):212719s CA
 TI ***Recovery*** of ***technetium***
 with active carbon column
 in partitioning process of high-level liquid
 waste
 AU Yamagishi, Isao; Kubota, Masumitsu
 CS Japan At. Energy Res. Inst.
 LO Tokai 319-11, Japan
 SO J. Nucl. Sci. Technol., 30(7), 717-19
 SC 71-11 (Nuclear Technology)
 SX 66
 DT J
 CO INSTAX
 IS 0022-3131
 PY 1993
 LA Eng

L4 ANSWER 7 OF 8 CA
 AN CA119(16):163796d CA
 TI ***Recovery*** of hydrocarbons from
 contaminated or waste
 petroleum and petroleum products by using a
 surface-treated
 permeable inorganic membrane
 IN Sleppy, William C.; Wieserman, Larry F.;
 Thomas, Kenneth M.;
 Goodboy, Kenneth P.
 PA Aluminum Co. of America
 LO USA

SO U.S., 8 pp.
 PI US 5209838 A 930511
 AI US 91-772205 911007
 SC 51-2 (Fossil Fuels, Derivatives, and
 Related Products)
 SX 60
 DT P
 CO USXXAM
 PY 1993
 LA Eng

L4 ANSWER 8 OF 8 CA
 AN CA119(11):112388q CA
 TI Optimizing the ***recovery*** of
 chemically reduced monoclonal
 antibody for site-specific ***technetium***
 -99m radiolabeling
 AU Boonkitticharoen, V.; James, H.; Cheung,
 N. K. V.; Larson, S. M.;
 Finn, R. D.
 CS Dep. Med. Phys., Mem. Sloan-Kettering
 LO New York, NY 10021, USA
 SO BioTechniques, 14(5), 706, 708
 SC 8-9 (Radiation Biochemistry)
 SX 14
 DT J
 CO BTNQDO
 IS 0736-6205
 PY 1993
 LA Eng

=> s 14333-24-5 and 1993-1994/py
 396 14333-24-5
 488590 1993-1994/PY
 L5 8 14333-24-5 AND 1993-1994/PY

=> s l5 not l1
 L6 7 L5 NOT L1

=> d l6 1-7

L6 ANSWER 1 OF 7 CA
 AN CA120(8):94132r CA
 TI Novel coated wire ion selective electrodes
 for estimation of
 perrhenate ion
 AU Agarwala, V.; Chattopadhyaya, M. C.
 CS Electrochem. Sensors Lab., Univ.
 Allahabad
 LO Allahabad 211002, India
 SO Analysis, 21(8), 349-52
 SC 79-2 (Inorganic Analytical Chemistry)
 SX 72
 DT J
 CO ANLSCY
 IS 0365-4877
 PY 1993
 LA Eng

L6 ANSWER 2 OF 7 CA
 AN CA120(4):44737w CA
 TI Ion-selective electrode for determining
 perrhenate ions in
 molybdenum-containing solutions
 IN Babenko, Nadezhda L.; Blokh, M. Sh.;
 Tashuta, Galina N.
 PA Institute of Metallurgy and Ore
 Benefication, Academy of Sciences,
 KazakhS.S.R.
 LO USSR
 SO U.S.S.R. From: Izobreteniya 1993, (3), 228.
 PI SU 1790764 A3 930123
 AI SU 90-4814925 900416
 SC 79-2 (Inorganic Analytical Chemistry)
 DT P
 CO URXXAF
 PY 1993
 LA Russ

L6 ANSWER 3 OF 7 CA
 AN CA120(4):38598k CA
 TI Electronic structures of d0 complexes by the
 DV-X.alpha. method
 AU Mukoyama, Takeshi; Adachi, Hirohiko
 CS Institute for Chemical Research, Kyoto
 University, Uji
 LO Kyoto 611, Japan
 SO Chem. Phys. Lett., 215(1-3), 93-6
 SC 65-3 (General Physical Chemistry)
 DT J
 CO CHPLBC
 IS 0009-2614
 PY 1993
 LA Eng

L6 ANSWER 4 OF 7 CA
 AN CA119(21):224277j CA
 TI Selective alteration of antibody
 immunogenicity
 IN Sykes, Thomas R.; Reddish, Mark; Baum,
 Richard P.; Noujaim, Antoine
 A.
 PA Biomira Inc.
 LO Can.
 SO PCT Int. Appl., 32 pp.
 PI WO 9318792 A1 930930
 DS W: AU, CA, FI, JP, NO, US
 RW: AT, BE, CH, DE, DK, ES, FR, GB, GR,
 IE, IT, LU, MC, NL, PT, SE
 AI WO 93-CA110 930318
 PRAI US 92-853605 920318
 SC 15-3 (Immunochemistry)
 DT P
 CO PIXXD2
 PY 1993
 LA Eng

L6 ANSWER 5 OF 7 CA
 AN CA119(12):126213r CA
 TI Heat capacities of tetrahedral oxoanions in
 aqueous solutions at 298
 K
 AU Drakin, S. I.; Popova, O. V.

CS Mosk. Khim.-Tekhnol. Inst.
 LO Moscow, Russia
 SO Zh. Fiz. Khim., 67(3), 606-8
 SC 69-2 (Thermodynamics, Thermochemistry,
 and Thermal Properties)
 SX 68
 DT J
 CO ZFKHA9
 IS 0044-4537
 PY 1993
 LA Russ

L6 ANSWER 6 OF 7 CA
 AN CA118(22):215319b CA
 TI Highly selective monoalkylene glycol
 catalysts
 IN Forkner, Matthew William
 PA Union Carbide Chemicals and Plastics
 Technology Corp.
 LO USA
 SO Eur. Pat. Appl., 17 pp.
 PI EP 529726 A1 930303
 DS R: BE, DE, ES, FR, GB, IT, NL
 AI EP 92-202570 920821
 PRAI US 91-749332 910823
 SC 45-4 (Industrial Organic Chemicals,
 Leather, Fats, and Waxes)
 SX 67
 DT P
 CO EPXXDW
 PY 1993
 LA Eng

L6 ANSWER 7 OF 7 CA
 AN CA118(16):157019r CA
 TI Raman spectra, absolute Raman intensities,
 and electrooptical
 parameters of pertechnetate, perrhenate,
 and periodate ions in
 aqueous solution
 AU Eysel, Hans H.; Kanellakopoulos, Basil
 CS Anorg.-Chem. Inst., Univ. Heidelberg
 LO Heidelberg 6900/1, Germany
 SO J. Raman Spectrosc., 24(2), 119-22
 SC 73-3 (Optical, Electron, and Mass
 Spectroscopy and Other Related
 Properties)
 SX 78
 DT J
 CO JRSPAF
 IS 0377-0486
 PY 1993
 LA Eng

=> s 14333-20-1 and 1993-1994/py not l2
317 14333-20-1
488590 1993-1994/PY
L7 10 14333-20-1 AND 1993-1994/PY NOT
L2

=> d l7 1-10

L7 ANSWER 1 OF 10 CA
AN CA120(16):202710p CA
TI Method and apparatus for concentration and
purification of
pertechnetate-99mTc solutions
IN Seifert, Sepp; Schneider, Frauke; Wagner,
Gerhard
PA Forschungszentrum Rossendorf E.V.; Verein
fuer Kernverfahrenstechnik
und Analytik E.V.
LO Germany
SO Ger. Offen., 5 pp.
PI DE 4229327 A1 940303
AI DE 92-4229327 920902
SC 71-6 (Nuclear Technology)
DT P
CO GWXXBX
PY 1994
LA Ger

L7 ANSWER 2 OF 10 CA
AN CA120(16):201370r CA
TI Adsorption of pertechnetate on an anion
exchange resin
AU Kawasaki, Mikio; Omori, Takashi;
Hasegawa, Kunihiro
CS Radiochem. Res. Lab., Shizuoka Univ.
LO Shizuoka 422, Japan
SO Radiochim. Acta, 63, 53-6
SC 66-4 (Surface Chemistry and Colloids)
SX 71, 79
DT J
CO RAACAP
IS 0033-8230
PY 1993
LA Eng

L7 ANSWER 3 OF 10 CA
AN CA120(14):176023v CA
TI Partitioning of actinides from acid waste
solutions of Purex origin
using CMPO
AU Mathur, J. N.; Murali, M. S.; Iyer, R. H.;
Ramanujam, A.; Dhami, P.
S.; Gopalakrishnan, V.; Badheka, L. P.;
Banerji, A.
CS Radiochem. Div., Bhadha At. Res. Cent.
LO Bombay 400085, India
SO Proc. Int. Conf. Technol. Expo. Future Nucl.
Syst.: Emerging Fuel
Cycles Waste Disposal Options, Volume 1,
601-6. Am. Nucl. Soc.: La
Grange Park, Ill.
SC 71-11 (Nuclear Technology)
DT C
CO 59PFAE

PY 1993
LA Eng

L7 ANSWER 4 OF 10 CA
AN CA120(5):49593f CA
TI Ligands for improved macromolecule
radiolabeling
IN Bridger, Gary James; Hernandez, Pedro
Emilio; Higgins, John David
III; Larsen, Scott Kenneth
PA Johnson Matthey PLC
LO UK
SO Eur. Pat. Appl., 13 pp.
PI EP 569132 A1 931110
DS R: AT, BE, CH, DE, DK, ES, FR, GB, GR,
IE, IT, LI, LU, NL, PT, SE
AI EP 93-302712 930407
PRAI GB 92-9641 920502
SC 9-14 (Biochemical Methods)
SX 8, 15, 23, 78
DT P
CO EPXXDW
PY 1993
LA Eng
OS MARPAT 120:49593

L7 ANSWER 5 OF 10 CA
AN CA120(4):38598k CA
TI Electronic structures of d0 complexes by the
DV-X.alpha. method
AU Mukoyama, Takeshi; Adachi, Hirohiko
CS Institute for Chemical Research, Kyoto
University, Uji
LO Kyoto 611, Japan
SO Chem. Phys. Lett., 215(1-3), 93-6
SC 65-3 (General Physical Chemistry)
DT J
CO CHPLBC
IS 0009-2614
PY 1993
LA Eng

L7 ANSWER 6 OF 10 CA
AN CA119(23):245192t CA
TI Accumulation of technetium by
cyanobacteria
AU Garnham, Geoffrey W.; Codd, Geoffrey A.;
Gadd, Geoffrey M.
CS Dep. Biol. Sci., Univ. Dundee
LO Dundee DD1 4HN, UK
SO J. Appl. Phycol., 5(3), 307-15
SC 10-2 (Microbial, Algal, and Fungal
Biochemistry)
DT J
CO JAPPEL
IS 0921-8971
PY 1993
LA Eng

L7 ANSWER 7 OF 10 CA
 AN CA119(21):224277j CA
 TI Selective alteration of antibody
 immunogenicity
 IN Sykes, Thomas R.; Reddish, Mark; Baum,
 Richard P.; Noujaim, Antoine
 A.
 PA Biomira Inc.
 LO Can.
 SO PCT Int. Appl., 32 pp.
 PI WO 9318792 A1 930930
 DS W: AU, CA, FI, JP, NO, US
 RW: AT, BE, CH, DE, DK, ES, FR, GB, GR,
 IE, IT, LU, MC, NL, PT, SE
 AI WO 93-CA110 930318
 PRAI US 92-853605 920318
 SC 15-3 (Immunochemistry)
 DT P
 CO PIXXD2
 PY 1993
 LA Eng

L7 ANSWER 8 OF 10 CA
 AN CA119(6):58044j CA
 TI The role of oxygen diffusion in the release of
 technetium from
 reducing cementitious waste forms
 AU Smith, Robert W.; Walton, John C.
 CS Idaho Natl. Eng. Lab.
 LO Idaho Falls, ID 83415, USA
 SO Mater. Res. Soc. Symp. Proc., 294(Scientific
 Basis for Nuclear Waste
 Management XVI), 247-53
 SC 71-11 (Nuclear Technology)
 SX 58
 DT J
 CO MRSPDH
 IS 0272-9172
 PY 1993
 LA Eng

L7 ANSWER 9 OF 10 CA
 AN CA118(16):157019r CA
 TI Raman spectra, absolute Raman intensities,
 and electrooptical
 parameters of pertechnetate, perrhenate,
 and periodate ions in
 aqueous solution
 AU Eysel, Hans H.; Kanellakopulos, Basil
 CS Anorg.-Chem. Inst., Univ. Heidelberg
 LO Heidelberg 6900/1, Germany
 SO J. Raman Spectrosc., 24(2), 119-22
 SC 73-3 (Optical, Electron, and Mass
 Spectroscopy and Other Related
 Properties)
 SX 78
 DT J
 CO JRSPAF
 IS 0377-0486
 PY 1993
 LA Eng

L7 ANSWER 10 OF 10 CA
 AN CA118(8):68680g CA

TI Technetium-99 removal from process
 solutions and contaminated
 groundwater
 AU Del Cul, G. D.; Bostick, W. D.; Trotter, D.
 R.; Osborne, P. E.
 CS Dep. Chem., Oak Ridge K-25 Site
 LO Oak Ridge, TN 37831-7274, USA
 SO Sep. Sci. Technol., 28(1-3), 551-64
 SC 71-11 (Nuclear Technology)
 SX 61, 66
 DT J
 CO SSTEDS
 IS 0149-6395
 PY 1993
 LA Eng

=> s 14333-20-1 and environment? and 1993-
 1994/py
 317 14333-20-1
 81746 ENVIRONMET?
 488590 1993-1994/PY
 L8 0 14333-20-1 AND ENVIRONMENT?
 AND 1993-1994/PY

=> s 14333-20-1 and separat? and 1993-1994/py
 317 14333-20-1
 100163 SEPARAT?
 488590 1993-1994/PY
 L9 0 14333-20-1 AND SEPARAT? AND
 1993-1994/PY