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ELECTRONICS SECTION

J. W. Heyd and P. E. Ohmart

ABSTRACT

Group 9

The Scaler-Multiplier EL-229, scale of 8,192 has been completed and turned over to the Construction Group.

Drawings for a scaler-multiplier with a scale of 16,384 have been completed.

The Vibrating Reed Electrometer is to be set up as a stable indication of activity in the measurement of polarization potential by determining the potential at which a radioactive material starts to plate out.

The General Chemistry Group desires to extend the sweep of anodic solution potentials with the plating control and a driven potentiometer. This study is now being undertaken.

Testing of the shielded rooms at Mound Laboratory is continuing.

Group 10

The Construction Group has moved to the "E" Building at Mound Laboratory. Sufficient furniture and equipment for normal operation has been obtained and construction is proceeding.

Two (2) two-input B wall mixers are 95 per cent complete and have been given preliminary tests.

A four-input GM mixer is 95 per cent complete and three scaler-multipliers have been started.

Three heavy current plating controls have passed resistor checks and are ready for the final solution test.

The Underwater Electrometer is complete with the exception of the glass scales to be furnished by the Photographic Department.

Group 11

The first modified Instrument Development Laboratory methane-flow counter has been in continuous operation in the Counting Room for a period of two weeks and has operated satisfactorily during this time.

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Modifications of the second Instrument Development Laboratory methane-flow proportional counter are complete and are identical to those of the first one as outlined in Electronics Progress Report, MLM-153, dated July 1-31, 1948.

Improper scaling of the high-rate neutron counter (EL-136) can be eliminated by careful selection of scaling tubes. Alteration of the design is being attempted so that tube selection will be less critical and the counter will still operate satisfactorily at high counting rates.

A second pulse generator giving one output pulse when the switch is thrown was built for servicing the high-rate neutron counter. The output pulse is variable in amplitude and width and may be of either polarity.

Group 12

During the past month the Electrolysis Group has noted a decrease in the life of half cells used in the plating lines. Possible causes of this short life and preventative measures were discussed by this group and the Electronics Section.

Group 13

Work was completed on the study of the way in which Logac counts vary with the thickness of the slide on which the sample is mounted. New Simpson standards were received for use at Mound Laboratory and are being counted daily.

Service cement is being used in the place of DeKohtinsky as a better means of cementing mica on a Logac.

Group 14 and Group 22

Routine counting was carried on as usual.

DETAILED REPORT

Group 9 - P. Ohmart, W. Baker, M. Birkhold, J. Hutchinson, F. Shepherd, and J. Stanton

The Scaler-Multiplier EL-229, scale of 8,192 has been completed and turned over to the Construction Group. The final report and instruction booklet have been written and are now being reviewed and co-ordinated. Circuit diagrams and panel and chassis lay-out drawings have been completed.

Drawings for a scaler-multiplier, scale of 16,384 have been completed.

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The Vibrating Reed Electrometer is to be set up in the General Chemistry Group as a stable indication of activity. It is to be used in determination of polarization potential by detecting the potential at which a radioactive material starts to plate out of a solution. This will replace the vacuum-tube voltmeter now in use.

The General Chemistry Group proposes to study anodic oxidation processes in an analogous manner to the polarographic and ionization chamber techniques now used to study cathode reduction reactions. In the research being conducted by this group, the electronic plating control coupled with the motor driven potentiometer has proven satisfactory as a device to vary the cathode-solution potential lineally with respect to time in the cathode solution potential region of -2 to $+1/2$ volts compared with the normal calomel electrode. It is now desired to increase the range and to provide a reversible linear sweep of the anode solution potential from 0 to a positive value of $1\ 1/2$ volts as recorded against a time axis. A study of this problem is now being made.

Testing of the shielded rooms at Mound Laboratory is continuing. The preliminary field strength measurements in the "R" Building of shielded rooms (107, 112, 116, and 166) have been completed. Final measurements of Rooms 113 and 104 in the "E" Building will continue after more urgent tests in the "R" Building are finished. Tabulation of the completed data in the form of curves and graphs is progressing slowly, but should be ready for the next Progress Report.

FUTURE PLANS

Continuation of the study of anodic oxidation process in an analogous manner to the polarographic and ionization chamber techniques now used to study cathode reduction reactions.

Testing of the shielded rooms at Mound Laboratory.

Group 10 - C. Hites, W. Adams, L. Cook, E. Daggett, A. Flaughner, R. Hemmer, R. Hurley, M. Lambert, G. Preston, R. Robinson, D. Santi, J. Winkler, and J. Yost

The Construction Group has moved to the "E" Building at Mound Laboratory. Sufficient furniture and equipment for normal operation has been obtained and construction is proceeding.

Two (2) two-input B wall mixers are 95 per cent complete and have been given preliminary tests. Frequency response of the amplifiers is not as wide as

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the three to four megacycles desired; all inputs will follow 170 kilocycles, the highest rate attainable with the available pulse generator. The 90 milliamp power transformer and filter chokes in the prototype were overloaded by about 25 milliamps and the transformer and chokes in all three units were replaced by 150 milliamp components.

A four-input GM mixer is complete with the exception of the meter dial and calibration. Again, the prototype power transformer was found to be overloaded and will have to be replaced.

Three scaler-multipliers (EL-150, EL-151, and EL-152) are being constructed to increase the Instrument Development Laboratory Model 162 scale from 256 to 16,384.

Three heavy current plating controls are ready for solution runs. Beckman saturated calomel electrodes have been obtained and agar bridges are being made at Unit III. The various types of simple half cells when used for a long period of time on the testing unit have given various degrees of trouble. The last type tried (small, sealed half cells) seem to be relatively free of the diffusion and consequent poisoning encountered with the liquid junction types, but has excessively high impedance. Use of the Beckman electrodes with agar salt bridges is expected to be more reliable and to cause a minimum of uncertainty in the testing process.

The Underwater Electrometer is 95 per cent complete except for the glass scales to be furnished by the Photographic Department. An elaborate series of photographs have been taken showing the components individually and in various stages of assembly. The "inside" tube leading from the ionization chamber to the electrometer head was made from ordinary steel pipe instead of stainless steel. This tube was finished by the "Penetrate" process (a process similar to bluing and guaranteed to withstand a 72 hour salt spray test) by Dayton Industries Incorporated as a sample job. All other parts have been carefully cleaned and assemblies have been checked for fitting. The control panel was baked and dri-filmed. Assembly for preliminary tests with gamma standards is scheduled for next week.

FUTURE PLANS

Continuation of construction as outlined in the Detailed Report.

Group 11 - L. Gnagey, W. Dean, K. Gregerson, E. Hoelzle, D. McKee, R. Shipp, and T. Zinn

The first modified Instrument Development Laboratory methane-flow proportional counter has been in operation in the Counting Room for a period of two weeks. Good plateaus have been obtained and it has been cross-checked with the Metallurgical Laboratory Simpson counter. Results were satisfactory.

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The second Instrument Development Laboratory methane-flow proportional counter has been modified in the same manner as the first one (refer to Electronics Progress Report, MLM-153, dated July 1-31, 1948). This counter has not been used in actual counting operations.

A second pulse generator giving one output pulse when the switch is thrown was built for servicing the high-rate neutron counter. This pulse generator consists of two switches, a 90 volt battery, a selection of ten condensers and a variable resistor. One of these condensers as selected is charged by a 90 volt battery through a single pole, double throw switch. Throwing the switch discharges the condenser through the variable resistor and the output pulse is taken off the arm of this resistor. This gives an output pulse which is variable from 0 to approximately 60 volts in amplitude. By selection of the 10 condensers available, the pulse width may be varied from approximately .5 to 25 microseconds. The circuit reversing switch between the battery and condenser makes the pulse available with either polarity.

The five sound-absorbing boxes for the Logac vacuum pumps have been completed. These are available for installation at Mound Laboratory.

FUTURE PLANS

Conversion of the remaining two out of four Instrument Development Laboratory methane-flow proportional counters were received from Oak Ridge.

The study of conditions affecting geometry of parallel plate and methane-flow alpha counters and the tests for determining the value of a proposed method for finding the per cent of distortion in a non-sinusoidal wave as outlined in Electronics Progress Report, MLM-153, dated July 1-31, 1948. Due to the press of other work, these studies have not been initiated.

Group 12 - W. Mead, K. DeBrosse, L. Gregg*, R. Hurley**

* On loan from Group 10.

** Pending clearance (Mound Laboratory).

A decrease has been noted for the past month in the life of the half cells used in the plating lines of the Electrolysis Group. Possible causes of this short half cell life are as follows: (Refer to Figure 1).

1. Gaseous tubes impressing a potential at "A" and effectively lowering the resistance of the input circuit.
2. Resistance short as indicated at "B"; caused by conducting film on the top of the plating cell.

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FIGURE 1

TYPICAL PLATING SET-UP

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3. An electrolytic film across the half cell at "C" shorting the half cell.

In addition to these contributing to the short life of half cells, it is doubted that the half cells are furnishing the proper reference voltage under these circumstances.

These effects can be determined and corrected in the following manner:

1. Disconnect all half cell leads at the front panel of the plating control, zero the vacuum-tube voltmeter on the ground position of the range selector switch and place this switch in the 200 millivolt position. Place channel selector switch in the external position. If there is a reading of more than five millivolts, the input 6AG5 tubes of the vacuum-tube voltmeter should be changed. Moving the selector switch to each of the four channels in turn will check the input tubes of these channels.
2. If there is no indication of a gaseous tube shown by the above tests and the vacuum-tube voltmeter indicates a potential when the half cell is plugged into the panel of the plating control, a conducting film on the top of the plating cell is present. Thorough cleansing and rinsing with distilled water on the top of the plating cell and the bridge will eliminate this film.
3. If the above tests are negative, there may be a conducting film on the half cell. This can be removed by thorough cleansing and rinsing with distilled water.

An Able Scientific Company GM tube in the gamma counter used by the Assay Group operated satisfactorily for a period of only one month. This is in line with the results of the tests run on these tubes which were outlined in Electronics Progress Report, MLM-153, dated July 1-31, 1948.

The gamma counters in the Process Group lines are functioning properly after having been calibrated.

FUTURE PLANS

Check periodically with Electrolysis Group to determine whether the half cell life is greater by using the techniques as recommended above.

Group 13 - M. L. Curtis

The study was concluded of the way in which Logac counts vary with the thickness of the slide on which the sample is mounted. Details of the work are

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given in a report to Dr. J. W. Heyd from Mrs. M. L. Curtis. Micrometered slides and squares of cover glass were piled on one another in various combinations with a sample on the top slide. The sample was counted at thirty different distances from the mica. A least squares determination of the curve formed by plotting distance from mica against count gave:

$$N = \frac{1.20526 \times 10^6}{d^{1.98516426}}$$

where N = count/min.
d = distance from mica.

This verifies that the count on any given sample varies inversely with the square of its distance from the mica. Further observation, as given in the report to Dr. J. W. Heyd, shows the importance of carefully gauging Logac slides for thickness, but suggests that slides from .035 to .037 inches thick could be used without introducing an appreciable error.

A large number of new equilibrium standards have been made. Two sets were selected and boxed and are being counted daily so they will be ready for the Simpson counters at Mound Laboratory.

Mica was put on our Logac with rubber cement and proved to be satisfactory with the exception of drying slowly. Service cement was then tried and found to be easy to apply, quick to dry and easy to remove. Therefore, it is to be used for this purpose instead of DeKohtinsky.

FUTURE PLANS

Compiling and calibrating standards for Mound Laboratory.

Group 14 - C. Brenneman, D. Barkalow, E. Harvill*, J. Hunt, E. Hyso, W. Littleton, and G. Wright

* On loan to Physics Group.

Counting this month at Unit III included the following:

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JWH:RFO/rcc

Instrument	No. of Samples	No. of Counts	No. of Counts on Chemist's Samples	No. of Std. Counts	No. of Bgr. Counts	Total
Parallel	445	603	905	157	1,665	
Logacs	952	975	870	255	2,100	
Logac L	578	1,166	219	145	1,530	
Total	1,975	2,744	1,994	557	5,295	

Following:

The counting load at Unit IV for the month of August included the

Group 22 - M. Bond, M. Keifenberger, L. A. Knuckles, E. Miller, A. Muldoon, M. Morgan, M. Owen, and R. Watrin

Instrument	No. of Samples	No. of Counts	No. of Counts on Chemist's Samples	No. of Std. Counts	No. of Bgr. Counts	Total
Parallel	347	479	995	88	1,562	
Plate Alphas	399	444	678	184	1,306	
Logacs	6	17	236	80	333	
Logac L	301	328	851	59	1,238	
Alpha Monitor	173	173			173	
Total	1,226	1,441	2,760	411	4,612	

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