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**TWO-STEP CHEMICAL DECONTAMINATION TECHNOLOGY
(U)**

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TWO-STEP CHEMICAL DECONTAMINATION TECHNOLOGY (U)

SUMMARY

An improved two-step chemical decontamination technique was recently developed at INEL. This memorandum documents the addition of this technology to the SRTC arsenal of decontamination technology. A two-step process using NaOH, KMnO_4 followed by HNO_3 was used for cleaning doorstops (small casks) in the SRTC High Level Caves in 1967. Subsequently, more aggressive chemical techniques have been found to be much more effective for our applications. No further work on two-step technology is planned.

DISCUSSION

Decontamination operations often consist of removing films containing radioactive material from Type 304L stainless steel surfaces. In applications where damage of the stainless steel surface is a concern, such as the inside of pipes in reactor cooling systems, strong acid cannot be used. In these applications multiple-step procedures are often used. One of the first successful procedures for use in this application was developed at the U.S. Steel Laboratories in 1951. The procedure consisted of treatment with alkaline permanganate (NaOH , KMnO_4) followed by soaking in HNO_3 . The alkaline permanganate changed the character of the film on the stainless steel to a more porous and reactive form, which was then dissolved on subsequent contact with the HNO_3 .

There have been many improvements of the multiple-step procedures. Turco markets chemicals for a two-step process. First, Turco 4502 is applied to the surface being cleaned. This pre-decontamination oxidizer and conditioner is a blend of potassium permanganate and

a wetting agent. Next, Turco 4521, which contains oxalic acid, is applied to the surface. These chemicals condition and remove the film from the surface of the stainless steel. Recently, J.G.Scott at the INEL found a combination of oxalic and nitric acids is very effective in use with surfaces pretreated with Turco 4502. Results of two plant trials show that the oxalic nitric combination (0.5 M HNO_3 , 0.5 M oxalic) is about four times more effective in removing contamination than either Turco 4521 or plain oxalic acid.

In applications where damage of the surface is not a concern a combination of strong acids is effective. ASTM A 380-88, "Standard Practice for Cleaning and Descaling Stainless Steel Parts, Equipment, and Systems", recommends a combination of nitric and HF acids for this application. In decontaminating the cavities of the 5320 plutonium oxide shipping containers for fire testing an etch using 3.5 M HNO_3 and 0.04 M HF at 50 degrees C was very effective. In decontaminating the SRTC High Level Waste Trailer not only surface films but also a layer of metal had to be removed. An etch using 3.5 M HNO_3 and 0.04 M HF is recommended to perform these operations at room temperature.

PROGRAM

No further work on two-step decontamination technology is planned.

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