

## Uptake of $^{239}\text{Pu}$ and $^{241}\text{Am}$ in Seawater *via* Diphonix<sup>TM</sup> and Actinide CU Resins

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New resins, marketed by Eichrom Industries, have the potential for selective uptake of several actinide ions from large volumes of acidic solutions. Diphonix<sup>TM</sup> resin, with its ability for fast and efficient uptake of actinide ions and its tremendous retention of these ions once complexed, could be used with large volumes of solutions. More recently, Eichrom Industries developed a resin which, in some instances, has a higher affinity for actinides than that of Diphonix<sup>TM</sup>, and little sensitivity to high concentrations of possible interferences and complexing acids. The Actinide CU resin may be used for preconcentrating actinides from a variety of matrices including soils and sediments as well as aqueous solutions. These characteristics make these resins attractive for work with seawater since the concentration of many actinides in this medium is extremely low. For example, to obtain a measurable amount of fallout plutonium in seawater requires collection of a sample up to hundreds of liters.

These resins are currently being tested at Florida State University and elsewhere to concentrate nuclides from many different sample mediums. The ionic strength of seawater is  $0.7m$ , which should not effect the performance of the resin. An acidified sample of seawater would not pose a problem for concentrating nuclides onto the resin. However, if filtered seawater could be passed through a bed of resin, without being acidified and still concentrate the nuclides, an applicable *in situ* method for concentrating nuclides in the oceans and surface waters could be developed.

The uptake rate of  $^{239}\text{Pu}$  onto Diphonix<sup>TM</sup> in a batch of acidified seawater may be shown by plotting the natural log of the count rate *versus* time (Fig. 1). The initial portion of the trend line should represent a first-order kinetic part of the nuclide-resin interaction. Using the slope of this line, it is possible to determine an appropriate half-time the nuclide will spend in solution. For the case of  $^{239}\text{Pu}$  in acidified seawater, half of the nuclide is removed from solution in 9.0 minutes.

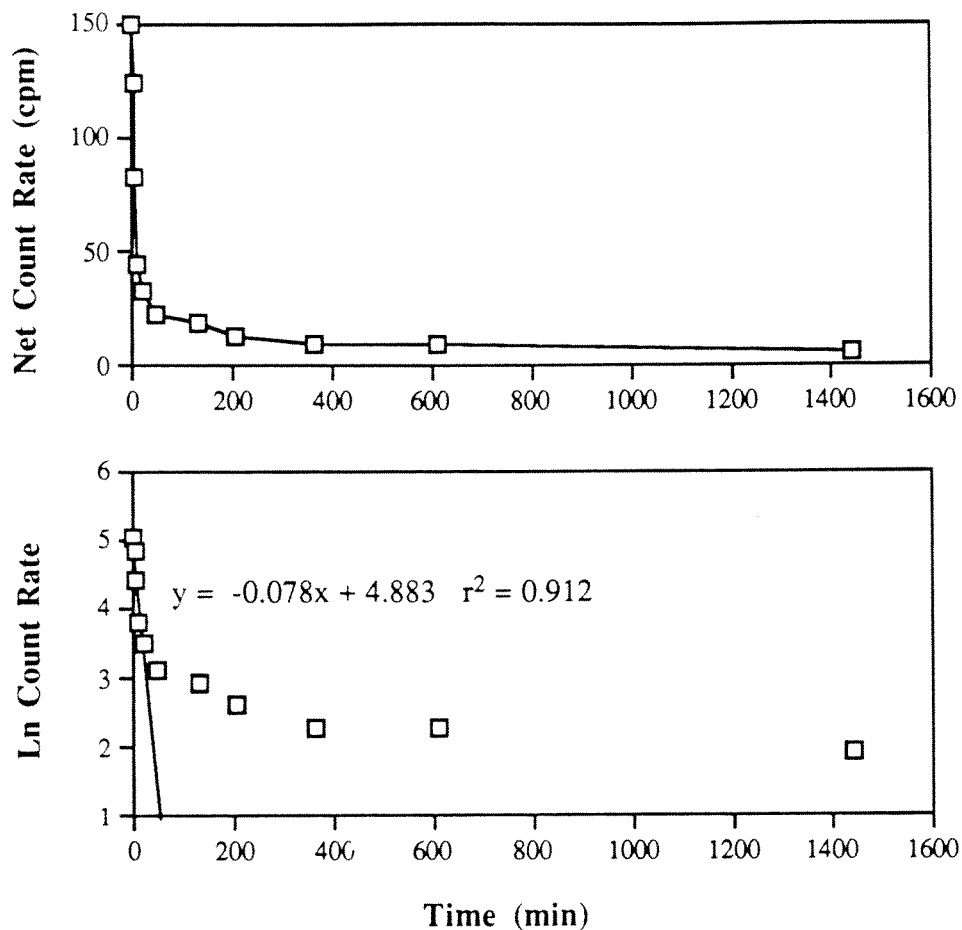


Figure 1. Experiment designed to measure the  $^{239}\text{Pu}$  uptake rate onto Diphonix<sup>TM</sup> resin from a 45 mL sample of acidified seawater. This sample was filtered (0.45  $\mu\text{m}$ ), spiked, and adjusted to a pH of 2 with dilute HCl. Aliquots (0.5 mL) were taken during the equilibration period.

This presentation will focus on the nuclides  $^{239}\text{Pu}$  and  $^{241}\text{Am}$  and the interactions they have with the two resins in both acidified and natural seawater. With 4 different oxidation states and strong particle reactivity,  $^{239}\text{Pu}$  is the more challenging nuclide. Measurements were made to determine the uptake rate of the nuclides and the efficiency of removing these nuclides from seawater. The implications of these results towards development of an *in situ* monitoring system will also be discussed.