

EVALUATION OF VARIOUS ION EXCHANGE RESINS FOR DETERMINING URANIUM GROUNDWATER FLUX¹

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Abstract: Ion exchange resins were evaluated for use in passive flux meters (PFM). The PFMs will be installed in uranium-containing aquifers to measure groundwater flow by the use of a displaced tracer, as well as the uranium flux through the meter. Resins were tested in the laboratory for maximum adsorption of uranium in various solution compositions and also in contaminated Rifle, CO groundwater using a fixed amount of resin. After a 24-hour equilibration time the solution and resins were separated. Percent sorption was determined by difference following analysis of the original solution and the solution exposed to the resin. In order to examine recovery, which is essential to determining uranium flux, uranium was desorbed from the resin using 1% nitric acid. Uranium analyses were performed by inductively coupled plasma-mass spectrometry. At a pH of 7.3 in synthetic waters, Dowex 21K, Lewatit S6328 A, and Purolite A500 anion exchange resins adsorbed over 99%, 95% and 94% of the uranium, respectively. These resins performed equally at 99% in natural waters. Effect of pH on the aqueous uranium speciation has some influence on the adsorption of uranium, but these effects are complicated by the presence of nitrate in the system. A solution acidified by hydrochloric acid showed little to no sorption by anion exchange, which is expected due to the dominance of UO_2^{2+} at the pH examined (3.8). However, pH adjustment to 3.8 with nitric acid showed a similar or reduced amount of sorption when compared to pH 7.3. Acid treatment showed 100% recovery of the adsorbed uranium from both resins. Tracer capacity and cost analysis will be done on these resins to determine the material used in the PFMs. These PFMs will be useful in studying the flow of uranium in the groundwater during ISR operations as well as in post-ISR monitoring.

Additional Key Words: adsorption, ICP-MS, ISR, monitoring

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