

Labware Evaluation for Selenium Sorption Experiments

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Abstract: Selenium (Se) is an essential trace element that is toxic at small concentrations. The United States Environmental Protection Agency has established a maximum concentration of $50 \mu\text{g L}^{-1}$ in drinking water and $5 \mu\text{g L}^{-1}$ as a chronic life criterion. Environmentally relevant concentrations are very low — $0.02 \mu\text{g L}^{-1}$ in freshwater, $0.08 \mu\text{g L}^{-1}$ in saltwater and 0.01-2 mg/kg in soil. Therefore, labware must be carefully chosen in order to prevent changes in sample composition over time as a result of interactions between sample and container. Our objective was to assess four materials (glass, silanized glass, Teflon, and polypropylene) for use in Se sorption studies. All glass containers were acid washed in a two stage acid bath for 24 hours per stage. Varying selenium stock solutions (0, 10, 25, and $50 \mu\text{g L}^{-1}$) were prepared in 0.1 M NaCl and delivered to each container. Samples were sealed and allowed to equilibrate for 6, 12, 24, or 48 hours to evaluate the ability of the material to suitably hold samples for sorption studies. ANCOVA was conducted on blank corrected samples as the acid used in analyses contains trace amounts of selenium. Results were statistically significant at concentrations of 25 and $50 \mu\text{g L}^{-1}$ with p-values of 0.0018 and 0.0001. Within each model, silanized glass corresponded to the smallest slope with 0.03, 0.04 and 0.06 at concentrations of 10, 25, and $50 \mu\text{g L}^{-1}$ respectively. In sorption studies, silanized glassware is recommended as it enhances sample integrity through limited losses to the material itself.

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