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How Do You Know If Uranium (U) and Arsenic (as) Are in Your Glass of Water?

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The 2020 Shared Knowledge Conference



How Do You Know If Uranium (U) and Arsenic (As) Are in Your Glass of Water?

PRESENTED BY ISABEL MEZA, UNIVERSITY OF NEW MEXICO

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Video link: <https://youtu.be/oqI0hVPjSfE>

My research aims to determine physical and chemical properties of sodium and potassium uranyl arsenate minerals (NaUAs and KUAs) integrating chemistry, spectroscopy, and modeling. To know when a uranyl arsenate is in its solid or liquid state in water needs to be further investigated, along with the processes for its origin: natural or human. This understanding can help to predict if uranium (U) and arsenic (As) concentrations are below the legally controlled levels. To obtain these properties, we followed three steps. First, we synthesized pure uranyl arsenate minerals. Second, we performed solubility experiments under controlled laboratory conditions. Finally, we did calorimetric analyses. Integrating all these results we know the following physical and chemical properties: The stoichiometries of both minerals: $\text{Na}(\text{UO}_2)(\text{AsO}_4)(\text{H}_2\text{O})_3$ and $\text{K}(\text{UO}_2)(\text{AsO}_4)(\text{H}_2\text{O})_3$, the solubility product ($\text{Log } K_{\text{sp}}$) for NaUAs (-24.048) and the standard-state enthalpy of formation for NaUAs and KUAs (-357.73 and -458.74 kJ mol⁻¹). We are working on the solubility product for KUAs during Coronavirus time. This work provides novel information that will be useful for reactive transport models/software that aim to interpret and predict when, how, and why U and As can be found in the environment, and eventually in our glass of water.