

Goldschmidt Medal Abstract Lanthanides and Actinides – Why Thermodynamics Matters

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Both lanthanides and actinides are widespread in the geochemical environment, though usually not in high concentrations. They are geochemical indicators for both age-dating and petrologic processes. Technologically, lanthanides are “critical elements” in applications from wind turbines to cell phones to LED lighting while actinides form the basis of the nuclear fuel cycle. Both groups substitute in a large number of minerals and technological materials. Selecting from recent research in my group, I will illustrate the importance of thermodynamic measurements in four areas: (1) transport of uranium in the environment through the formation of uranyl peroxide compounds and clusters, (2) the formation and metastability of coffinite, $USiO_4$, (3) the incorporation of rare earths in gypsum waste products from fertilizer production, and (4) the incorporation of lanthanides in various perovskite minerals.