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Coordination Chemistry of +3 Actinium

Targeted alpha therapy (TAT) represents an emerging technology that has potential in treatment of disease. Amongst many isotopes showing promise in TAT, 225-actinium (225Ac) stands out. Its half-life is compatible with many medical applications and its decay is accompanied by emission of four alpha-particles, which augments 225-Ac's therapeutic benefit in comparison to isotopes that produce only one alpha-particles. A challenge facing 225-Ac's use in medicine is identification an appropriate chelator, one that (1st) achieves fast room temperature Ac-binding kinetics and (2nd) irreversible binds AcIII during transport through the patient to the target. Unfortunately, it is difficult to predict what chemical factors lead to successful chelation, in large part, because Ac-coordination chemistry is poorly characterized. This presentation will document our recent efforts toward advancing predictive capabilities in Ac-chelation. The talk will center on comparative EXAFS, NMR, and DFT studies focused on advancing understanding of Ac(III)–binding with numerous macrocyclic chelates.

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