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Synthesis and complexation of nitrogen donor ligands with tetravalent uranium

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The knowledge of complexation reactions of early actinides with nitrogen donor ligands serves not only as fundamental research in this underrepresented field of chemistry but also contributes to a deeper understanding of their reactivity and coordination chemistry. In contrast to the lanthanides, with the dominating oxidation state of + III, actinides, especially the early actinides up to Plutonium, can exist in a variety of different oxidation states ranging from +II to +VI.
The coordination chemistry of tri- and tetravalent actinides with selective soft nitrogen donor ligands is of special interest, with a potential use as extraction and/or decontamination agents.
In order to understand the bonding trends and electronic structure, the nitrogen donor ligand 2,6-bis(1-(4-bromo-2,6-dimethylphenyl)-1H-1,2,3-triazol-4-yl)pyridine, a BPTP-type ligand, was used as the compound of choice in this contribution. BPTP-type ligands are based on the commonly known BTP-ligand, a tridentate chelating ligand which was designed for the purpose of separating lanthanides from actinides.[1] The BPTP ligand was synthesized by a copper mediated click reaction of 2,6-diethynylpyridine with the corresponding azide.
Within this ongoing study, we focus on the synthesis and characterization of tetravalent actinides, which are readily available for all of the early actinides from Thorium up to Plutonium.
The obtained U(IV) complex was characterized by single crystal X-ray diffraction (SC-XRD). Further characterization of the novel coordination complex using NMR, IR, and EPR, as well as an expansion to the transuranic elements will complete this study.

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[1] Z. Kolarik, U. Müllich, F. Gassner, Solvent Extr. Ion Exch. 1999, 17, 23–32.

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