

Synthesis and Reactivity of Actinide Sandwich Complexes supported by the cyclo-butadienyl ligand.

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Organometallic sandwich complexes of the actinides continue to play an important role in understanding the diverse facets of bonding and reactivity of the 5f block elements. A plethora of molecular actinide complexes supported by cyclopentadienyl (C₅), arene (C₆), cycloheptatrienyl (C₇), cyclooctatetraenyl and pentalene (both C₈) ligands are known, as well as organometallic compounds featuring combinations of these ligands, often referred to as mixed sandwich complexes. By comparison the coordination chemistry of the cyclo-butadienyl ligand [C₄(SiMe₃)₄]²⁻ (Cb''') with f-elements can only be described as scarce, with the first examples of its coordination to lanthanide(III) metal centres described by our group.¹ More recently we,² and others,³ have extended the coordination chemistry of the Cb''' ligand to 5f block metals and specifically uranium and thorium. In this talk, our recent advances in the synthesis of An(IV)Cb''' organometallic complexes (An = U, Th) from simple starting materials as well as studies of their reactivity, are highlighted. These include new members of the U(IV) azulene family⁴ (e.g. [U(η⁸-C₈H₈)(η⁴-Cb''')]), observation of metal-ligand co-operativity in the activation of diethyl-ether, preparation of heteroleptic Th(IV) Cb''' complexes and finally preliminary results showing that the Cb''' scaffold can stabilise low-valent U(III) complexes. Our investigations point to a rich and diverse chemistry and reactivity engendered by the Cb''' ligand, the surface of which we have only begun to scratch, and which can have a significant impact in the fields of small molecule activation and molecular magnetism.⁵

References:

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