Synthesis of an aluminum-scandium bonded compound from a newly-designed aluminum anion

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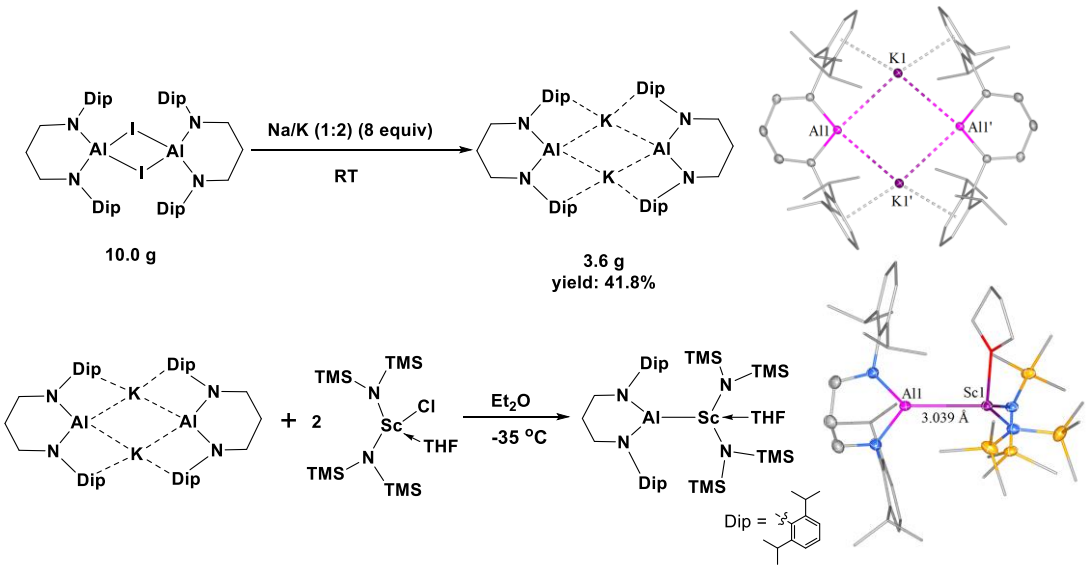
Recently found aluminum anion in oxidation state of one have shown utility in small molecule activation, inert bond activation, and access to unusual chemical structures, such as aluminum-containing heterobimetallic systems.[1] However, the field of aluminum anion is still in its infancy, and only limited examples of aluminum anion have been available. Therefore, it is of great significance to synthesize aluminum anions in a large scale, which would facilitate a further exploration of their unique reactivity and applications. Herein, we report a scalable synthesis of new aluminum anion and its application to construct an Al–Sc intermetallic bond.

Large-scale synthesis of aluminum anion was performed by treating 10 g of dimeric aluminum(III) iodide precursor having 1,3-diaminopropylene ligand with Na/K alloy, and the corresponding aluminum anion was isolated as yellow crystalline solids. X-ray analysis revealed its dimeric structure. This aluminum anion can work as aluminum-centered nucleophile to react with diamidoscandium chloride, and hitherto unreported Al–Sc bonded compound was isolated as pale yellow crystalline solids. X-ray analysis showed the existence of the unsupported Al–Sc bond of 3.039 Å, that is ca. 0.3 Å longer than the sum of their covalent radii (2.74 Å).



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