Main group compounds for bond activation and catalysis

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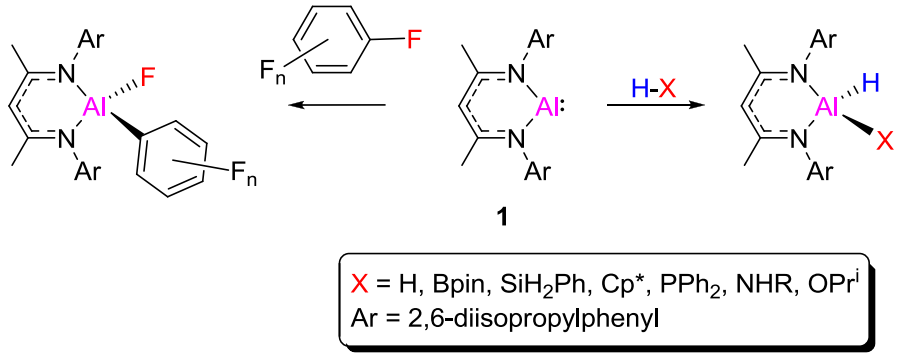
Main group metal catalysis is of great current interest due to its potential to circumvent the high cost and toxicity of common transition metal catalysts.[1] One of the major hurdles in this area is the lack of oxidative additions of robust σ bonds (e.g. H–X, C–X, P–P, S–S) to main group centres.[2,3,4] However, recent work has demonstrated the ability of low valent main group compounds to mimic transition metal complexes in the cleavage of strong single bonds.[2]

We have recently reported facile activation of H–X bonds (where X = H, B, Al, C, Si, N, P, O) by the *β*-diketoiminato stabilized complex of aluminum in the +1 oxidation state, **1**.[5] We have since extended the scope of bond activations to other single bonds including carbon–oxygen, carbon–sulfide, and carbon–halide as well as element–element bonds in disulfides and diphosphines.[6] Complex **1** is able to oxidatively add the very robust C-F bonds in aryl and alkyl fluorides.[7] We are now very well positioned to cleave multiple bonds X=Y (X=C, P; Y=S, N, O).[8,9]

Our efforts to prepare zero-valent main-group complexes will be also discussed.[10]



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