Tata Institute of Fundamental Research
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Internal Seminar

Reactivity Aspects of Elusive Multiple-bonded Aluminum Compounds

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TIFR, Hyderabad

Compounds containing homo-, heteronuclear multiple bonds of carbon have significant impact in virtually all areas of chemistry as versatile precursors and functional products. Various functional group tolerances of these unsaturated moieties are the key to the feasibility of elaborate synthetic protocols. On the other hand, Multiple-bonded compounds of other heavier group 14 or group 13 elements are highly reactive and are not stable under open atmospheric condition. In the past couple of decades this led to a widespread interest in their peculiar structures and bonding, which arises from the fact that they possess trans-bent or strained geometries that are in sharp contrast to their lighter element counterparts, which have uniformly linear structures. Despite many attempts, it took until 1973 before Lappert et al. isolated the first heavier Lead and Tin analogues of alkenes i.e. diplumbene and distannene with the aid of sterically bulky ligand. Later, plethora of neutral double-bonded compounds (dimetallenes) from group 13-15 were isolated through employment of required kinetic protection by sterically demanding substituents (aryl, alkyl or silyl) to suppress the thermodynamically favoured formation of saturated dimers or oligomers. In fact, all of those compounds have shown widespread exotic reactivity such as transition metal free small molecule activation and to serve as model compound to study the reactivity patterns of the bulk surface. Nonetheless, corresponding multiple bonded chemistry of aluminum remains elusive despite its high natural abundance (8.2 %) on earth's crust. In fact none of such compounds of aluminum were isolated and remain as notoriously difficult synthetic target until 2017, when our group maneuvered the seminal isolation of the first neutral double bonded compound, namely dialumene.

In this talk I'll show how we could able to decipher the first neutral multiple-bonded aluminum compounds through novel and unique synthetic protocol. Moreover, its subsequent reactivity studies towards various small molecules including catalytic and stoichiometric activation of carbon dioxide (obnoxious greenhouse gas) will also be discussed.

Monday, Apr 1st 2019

3:30 PM (Tea/Coffee at 3:15 PM)

Seminar Hall, TIFR-H