Recent achievements on functionalization within closo-decahydrodecaborate $[B_{10}H_{10}]^{2-}$ clusters

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ABSTRACT

Closo–decahydrodecaborate $[B_{10}H_{10}]^{2-}$ is one of the most famous clusters in hydroborates family, characterized by its thermal and chemical stability. It has several applications especially as medicinal drug in the treatment of cancer by BNCT technique "Boron Neutron Capture Therapy" [1].
The structure of $[B_{10}H_{10}]^{2-}$ presents two distinct environments of boron atoms, apical (B_1, B_{10}) and equatorial (B_2 to B_9), with different electronic distributions which confer a versatile and exceptional reactivity over the cage as a whole (Figure 1). This property makes some reactions only possible on $[B_{10}H_{10}]^{2-}$.

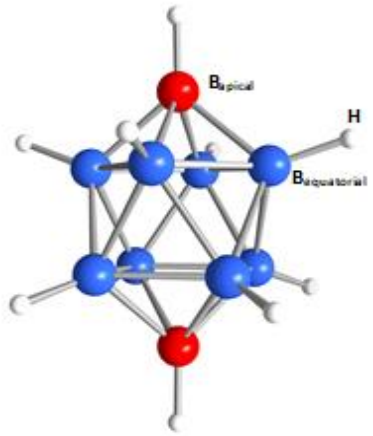

Figure 1. Structure of $[B_{10}H_{10}]^{2-}$

The major challenge in the development of $[B_{10}H_{10}]^{2-}$ chemistry refers to its functionalization by activation of the B–H to B–L bonds to generate attractive molecular construction modules of useful applications. The choice of L group (hydrophobic or hydrophilic) depends on the target of application. Coupling the boron moiety to any substance L may enhance the properties and applications of both boron and L fragments. Since the sixties, the activation of equatorial B–H bonds of $[B_{10}H_{10}]^{2-}$ was known to proceed by the Electrophilic Induced Nucleophilic Substitution **EINS**; $[B_{10}H_{10}]^{2-}$ reacts with Lewis bases L (solvents) in strong acidic medium to produce substituted derivatives $[B_{10}H_9L]^{2-}$, $[B_{10}H_8L_2]^{2-}$ and $[B_{10}H_7L_3]^{2-}$. We noticed that this reaction was not studied in details; for example, the effect of Lewis bases, the temperature applied, the time of the reaction and the nature of the acid used.
Our work [1-21] in LCIO laboratory is focused on the activation of the apical and equatorial B-H of $[B_{10}H_{10}]^{2-}$ to B-L bond. We present the new methods of activation including the new advances in:

- **EnpR: Encapsulation Reaction**
- **CR: Coupling Reaction**
- **SR: Substitution Reaction**
- **CaR: Catalyzed Reaction**
- **COR: Cage Opening Reaction**
- **ClR: Click Chemistry Reaction**
- **EINS: Electrophilic Induced Nucleophilic Reaction**

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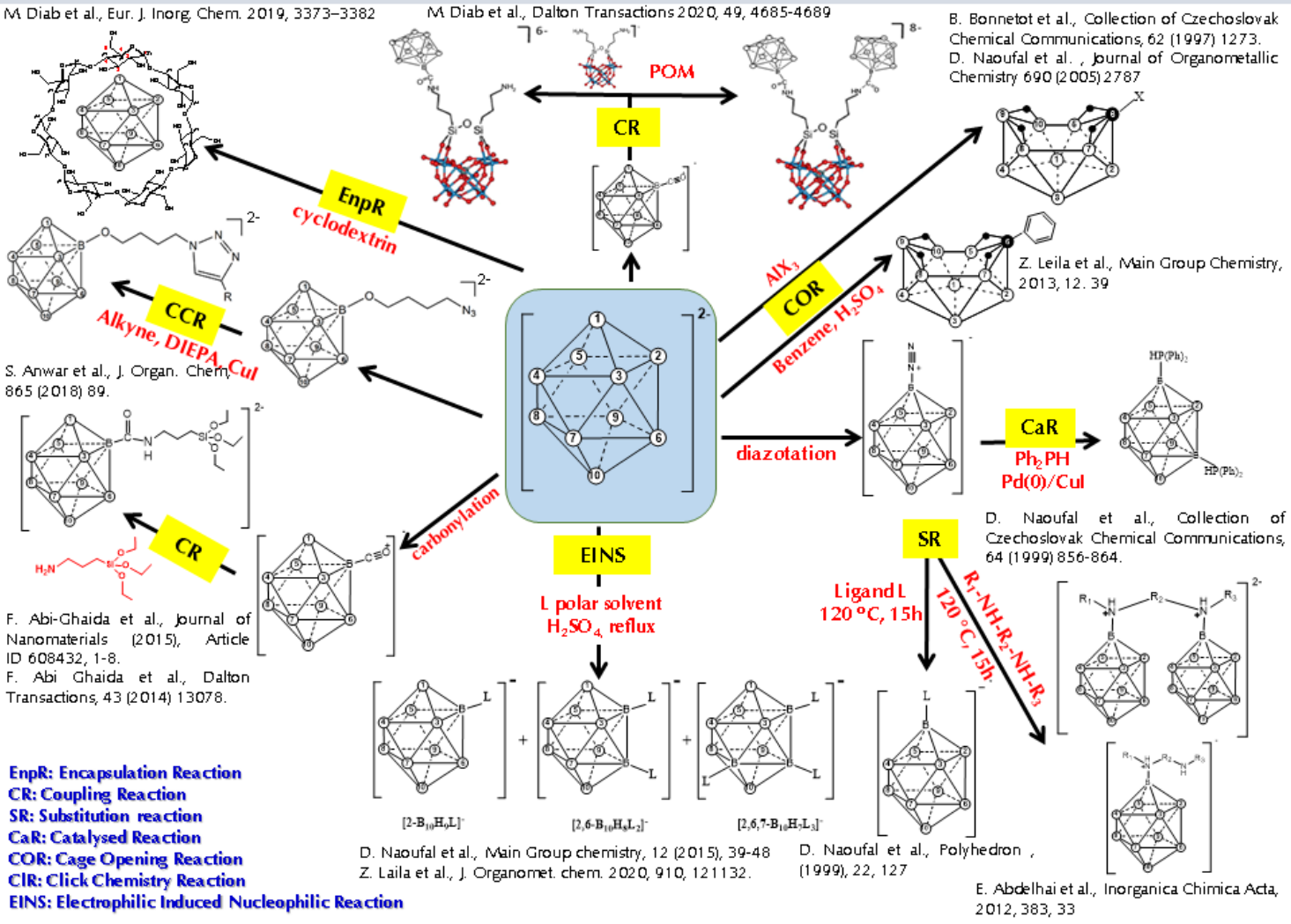
(LCIO) Laboratory is specialized in the functionalization of $[B_{10}H_{10}]^{2-}$



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