CATALYTIC HYDROGENATION AND DEHYDROGENATION REACTION MECHANISMS MEDIATED BY MOLYBDENUM SULFIDE CLUSTERS

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MoS_2-based materials, both crystalline and amorphous, have become a research hotspot in catalysis.[1] The inherent difficulties to obtain mechanistic information from heterogeneous catalysts have lead to the design of molecular clusters capable of emulating the reactivity of these solid materials. Given the structural similarities, cuboidal $Mo_3(\mu_3\text{-}S)(\mu\text{-}S)_3$ clusters can been considered as models of the basal planes of MoS_2, as illustrared in Figure 1.

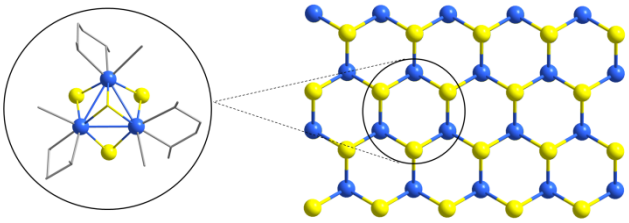

Figure 1. Toplogical relationship between Mo_3S_4 clusters and the MoS_2 basal planes.

Diamino and imidazolyl amino Mo_3S_4 clusters catalyze the semihydrogenation of alkynes as well as the hydrogenation of azo- and nitroarenes to afford aniline.[2-3] Interestingly, hydrogen activation in both reactions occurs without direct participation of the metal. Diphosphino Mo_3S_4 cluster hydrides and imidazolyl amino Mo_3S_4 clusters are active catalyst for the dehydrogenation of formic acid. In this last case, the catalytic activity is centered on the metal.[4]

In this presentation, we will discuss the catalytic protocols developed in our group for the semihydrogenation of alkynes and for the hydrogenation of azo- and nitrocompounds using Mo_3S_4 clusters. Dehydrogenation of formic acid catalyzed by these cluster complexes will be also discussed. Special empashis will be placed on their reaction mechanisms.

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