ZEOLITE SURFACE PASSIVATION: "CORE-SHELL" SYSTEMS FROM SYNTHESIS TO CATALYTIC APPLICATIONS

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Tuning the acidity of zeolite catalysts is one of the most important concerns for improving their catalytic performances. This challenging topic, studied for decades, consider that acidity in zeolites could hold either within the structure channel or at the external surface. Sometimes this classification did not receive sufficient attention leading out of the way the scientific efforts to optimize the catalyst properties. In fact, acid sites out of the surface can promote undesired reactions as the "shape selectivity" action of zeolite does not play any role, at the external surface. This is a common observation than, in the case of reactions with hydrocarbons, lead to the formation of coke species, compromising the catalyst efficiency and productivity.

Different post-synthesis techniques have been proposed to reduce the surface acidity in a controlled way and one of most stimulating is the epitaxial growth of a secondary phase of non-acidic zeolite acting as passivating layer. This leaded to the definition of the "Core-shell" systems: a class of zeolite-based materials having a non-acid shell over an active core. This technique was revealed also promising when in the case of zeolites in "hybrid" (Red-Ox/Acid) catalyst as the interaction between the two phases could affect the metal stability as negative consequence of the surface acidity (uncontrolled reactivity, water adsorption). In this concern, the option of a "phase segregation" as result of a surface passivation offers the advantage from the reduction of metal-acid sites interaction without giving up to the benefits for zeolitic support to metal catalyst (high specific surface area, microporosity, potential proximity effect between active sites).

The lecture will cover the topic of surface passivation via zeolite growth accounting for the different synthesis conditions (zeolitic or metallic core), microporous/mesoporous core structure and zeolite type, aiming at elucidating drawbacks and advantages of this approach, trying also to supply new ideas about the core-shell synthesis technique, then could be attractive for different applications.