Functionalization and Application of Hollow Zeolite Structures

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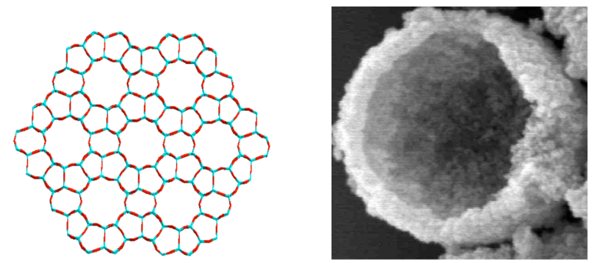
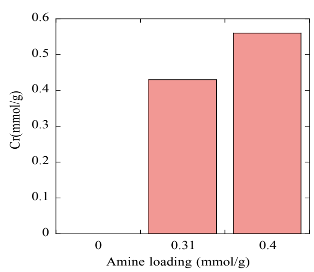
Zeolites present a unique opportunity for forming hollow structures with controlled porosity. Hollow zeolite structures (figure right) are formed using mesoporous silica as a sacrificial template. The hollow zeolite structures consist of a **shell** that has the characteristic porosity and ion-exchange properties of the parent zeolite and **interior and exterior surfaces** that have terminal silanol groups which can be readily functionalized using organosilane reactions.



Structure of ZSM-5 (left) and SEM image of a hollow ZSM-5 structure (right).

We have developed strategies for functionalizing the interior and exterior surfaces of the hollow zeolite structures and nanocrystalline zeolites. We have prepared **copper** and **vanadium exchanged and encapsulated hollow ZSM-5 tubes, APTES functionalized silicalite tubes and bifunctional (APTES and iron) functionalized zeolites**. The Cr(VI) adsorption on APTES functionalized zeolites and zeolite tubes is depicted in the figure below. The bar graph illustrates that as the APTES loading increases the chromate adsorption capacity increases concomitantly. Copper adsorption on functionalized zeolites was also investigated.



Adsorption of chromate from aqueous solution