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Polyhedral Cage-Containing Mesoporous Metal-Organic Framework

Researchers at the University of South Florida have developed a polyhedral cage-containing mesoporous metal-organic frameworks (MOFs) as a new type of host matrix materials to immobilize proteins/enzymes for biocatalysis applications.

In order to utilize proteins/enzymes as biocatalysts for applications in chemical, pharmaceutical, and food industries, it requires successfully stabilizing them in what is often an unnatural environment while retaining their functions and activities. Mesoporous MOFs feature high surface area, structural versatility, and functional amenability. These merits afford the immobilized proteins/enzymes with enhanced stability and activity as well as solvent adaptability, which opens a new avenue for proteins/enzymes immobilization as heterogeneous bio-catalysts.

Our inventors have developed a nanoscopic cage-containing mesoporous metal-organic framework (MOF) as a new type of host matrix materials. They have presented, for the first time, the successful immobilization of enzyme and protein into mesoporous MOFs and demonstrated that they can significantly enhance the stability and activity of the immobilized enzyme or protein, surpassing the widely studied mesoporous silica materials. There is currently no precedent for mesoporous MOFs as host matrix materials for enzyme/protein immobilization.

The potential relevance of this invention is the development and discovery of a new type of host matrix materials to immobilize enzymes or proteins that significantly impacts chemical, pharmaceutical, and food industries.

ADVANTAGES:

- **Various biocatalysis applications in chemical, pharmaceutical and food industries**
- **Enhanced activity and stability of the immobilized enzyme as compared to current technologies = cost savings**
- **High surface area, structural versatility and solvent adaptability**

Novel Type of Matrix Materials to Enhance Efficiency of Biocatalysis Applications

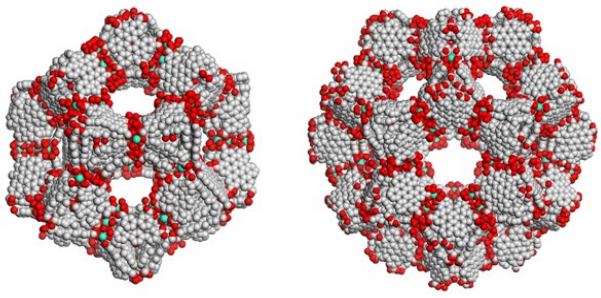

Figure 1: 3.9 nm-diameter cage in Tb-meso MOF. Figure 2: 4.7 nm-diameter cage in Tb-meso MOF

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