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Synthesis of highly active supported Pt nanostructure via thermo-destabilization of microemulsions

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In improving the catalytic activity of the noble metals, the surface morphology has become an area of investigation over the past decades. The shape control of metal particles during synthesis, that is to direct the crystallographic planes, coordination of surface atoms and bounding facets of the nanocrystals, is important. These parameters determine the number of atoms located at the edges or corners and accordingly control the surface chemistry which holds the key for improving their catalytic performance. The shape that possesses high-index planes (low-coordinated atoms) is preferable because generally it has high surface energies and thus exhibits high activity. To produce nanoparticles which have high-index planes, the preferred growth direction during synthesis is anisotropic growth. Our first attempt is to produce platinum (Pt) nanocrystals with a small size (2.5 nm) of an isotropic structure i.e., truncated octahedral and deposit them well on support materials. We followed the strategy to keep the small size but change the shape to anisotropic structure of Pt nanocrystals which produces more active sites by means of a weaker reducing agent. We found that the catalysts of anisotropic structure are more active than those of the isotropic ones and even show potential to be applied in a challenging reaction such as hydrogenation of levulinic acid. We continue our effort not only in improving the performance of the nano-catalyst, but also making it in a greener way by using natural reductant such as green tea and grape seed. We found that the produced Pt nano-catalysts are also anisotropic and active at a very mild condition in hydrogenation of levulinic acid which usually is conducted at high pressure and temperature.

Biography

Riny Yolandha Parapat has her expertise in "Synthesis of nano-crystal via microemulsions technique". Her great passion is to create and develop nanomaterial especially in the field of Catalysis. She is also concerned about the environment; her research is now heading to the field of Green Synthesis and Biofuel Production. Her advance knowledge and experience in microemulsions making her able to synthesize and design the super active nano-catalysts in a greener way. She has discovered a new method to synthesize highly active supported nano-catalysts, so-called thermo-destabilization of microemulsions. She is a Lecturer in the course of Kinetic and Catalysis, Experimental Design, Process Control, and Plant Design.

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