

Shape-controlled Platinum Nanoparticles Directly Synthesized Inside Mesoporous Silica Supports

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Depositing the shaped nanoparticles into a mesoporous supports is difficult. The shaped platinum nanoparticles with 5-10 nm size can be deposited by some methods. The general methods are the capillary inclusion and the formation of a mesoporous framework around the shaped nanoparticles. But the shape of nanoparticles were degraded and aggregated easily. In this research, platinum nanoparticles were directly nucleated on the pore surface inside the mesoporous silica support with controlled the overgrowth step. MPTMS was used as an anchoring agent at the mesoporous silica surface, and it also shape-control the nanoparticles. Platinum nanocubes were synthesized with polymeric capping agents separately and deposited inside mesoporous silica by sonication. But most of the nanoparticles were clogged and the amount of active sites on the surface of the platinum was low. Unshaped platinum nanoparticles were synthesized by conventional wet impregnation method and showed similar amount of catalytic active sites to the shaped platinum cubes. But the selectivity to pyrrolidine in pyrrole hydrogenation was poorer. The mesoporous structure of supports and the residual thiol groups on the surface of the Pt nanocubes might cause high selectivity for pyrrolidine.