

Effect of support size on the catalytic activity of metal oxide-doped silica particles in the glycolysis of polyethylene terephthalate

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Zinc oxide (ZnO) and cerium oxide (CeO₂) nanoparticles were deposited on the surface of preformed silica spheres with diameters ranging from 60 to 750 nm. Ultrasonic irradiation was employed to promote the deposition of the metal oxide nanoparticles on the surface of silica. Silica-supported zinc oxide or cerium oxide was used as a catalyst in the glycolysis of polyethylene terephthalate, one of the key processes in the depolymerization of polyethylene terephthalate. The effect of the support size on the catalytic activity was studied in terms of monomer yield, and the monomer concentration was analyzed via high-performance liquid chromatography (HPLC). The morphologies and surface properties of the catalysts were characterized using a scanning electron microscope, a transmission electron microscope, and a BET surface area analyzer, while the monomer was characterized via HPLC and nuclear-magnetic-resonance spectroscopy.