Iridium nanostructured metal oxide, its inclusion in silica matrix and their activity toward photodegradation of methylene blue

Diaz C.

Valenzuela M.L.

Cifuentes-Vaca O.

Segovia M.

Laguna-Bercero M.A.

Precious metal oxides of IrO2 were prepared by thermal treatment of the macromolecular Chitosan?(IrCl3)X and PSP-4-PVP?(IrCl3)X precursors. Using this procedure, pure IrO2, phases were formed. The nature of the polymeric precursor is acting as a solid state template and influences the size of the iridium dioxide but not significantly the morphology, and the obtained IrO2 nanoparticles are about 15 nm. For the first time, the photocatalytic degradation of methylene blue using IrO2 was measured founding a moderated activity. The inclusion of IrO2 into SiO2 was performed using a combined solution of the Chitosan and PVP precursors by the sol-gel method. Subsequent pyrolysis of the isolated solid-state Chitosan?(IrCl3)x(SiO2)y and PSP-4-PVP?(IrCl3)x(SiO2)y give rise to the IrO2//SiO2 nanocomposites. The IrO2 particles are distributed uniformly inside the matrix of SiO2 leading to stable semi porous materials appropriate for high temperature catalytic applications. The IrO2 nanoparticles formed from the PVP precursor are mainly nanobars of 10 nm width, while that for the chitosan precursor are around 25 nm. The IrO2/SiO2 composites exhibit a moderate photocatalytic activity toward the degradation of methylene blue and similar to that of IrO2.

Chitosan

Iridium oxide

Photocatalysis

Polyvinylpyrrolidone

Silica

Aromatic compounds

Chitosan

High temperature applications

Metals

Nanoparticles

Photocatalytic activity

Porous materials

Silica

Silicon

SiO2 nanoparticles

Sol-gel process

Sol-gels

Catalytic applications

Combined solution

High temperature

Iridium dioxide

Nanostructured metals

Photo catalytic degradation

Photodegradation of methylene blue

Polymeric precursors

Iridium compounds