Abstract

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Project Title : New method for the preparation of heterogeneous catalyst for carbon monoxide oxidation through electrostatic surface modification and metal ions impregnation

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Abstract:

A new method for the preparation of catalyst for photo-degradation of toxic compounds such as dye or carbon monoxide oxidation is proposed. In this research project an alternative route for the layer by layer deposition and the impregnation of Silver ions onto catalyst substrate was developed. Two types of catalyst , Cerium oxide (CeO_2) and ZnO were used for the photo –degradation of a dye with and without silvernanoparticles. The ZnO particles were coated in polyelectrolyte multilayers thin film to enhance the electrostatic charge at the surface of the substrate and increase the silver ions loading on the catalyst. The substrates were modified by sequential dipping in oppositely charged polyelectrolytes which result in the formation of polyelectrolytes multilayers (PEM) through electrostatic complexation onto a substrate. The PEM film composition was formed using the synthetic polyelectrolytes pairs that are poly (diallyl dimethyl ammonium chloride) and poly(4-styrene sulfonate sodium salt). The PEM film growth at the surface of the substrate was characterized using UV-Vis spectroscopy and Scanning electron microscopy (SEM). In a second step, Silver nanoparticles were used as core structure and then coated with cerium oxide to form a core shell structure of Ag/CeO_2. In the case of ZnO, silver nanoparticles we co-deposited in a layer by layer approach to form a blended composite layer. The prepared catalyst CeO_2 and ZnO were tested for their photocatalytic activity against methyl violet and it Was found that adding silver nanoparticles could improve the activity. The CeO_2 samples were further tested for their catalytic efficiency against CO oxidation in a catalytic reactor connected to a gas chromatography system.

Keywords : catalyst, coating , nanoparticles