Extended Abstract

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Synthesis of Vinyl acetate over Pd-Cu/ZrO2 nanostructured based catalysts

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Abstract:

Catalytic oxidation is considered as a suitable route for the production of oxygenated compounds from lignocellulose biomass. The development of routes to convert green ethylene from renewable sources, have been motivating other possible applications like green monomers, fuels, and fine chemicals. In this research work we prepared Pd-Cu catalysts over ZrO2 mixed oxides. The catalysts were characterized by following methods XRD-in situ, BET, H2 chemisorption and High-Resolution Transmission Electron Microscopy (HRTEM). Catalytic tests were performed through experimental planning. Statistical analyses allowed finding the main correlations of the products. The Vinyl acetate monomer formation was influenced by the AcOH and O2 consumption at low ethylene coverage. Acetaldehyde appeared as an important intermediate for Vinyl acetate monomer synthesis. XRD results showed that the Pd-Cu catalyst exhibit tetragonal/orthorhombic nature with differences in the lattice position. The presence of Cu+2 in the lattice describes the promotion of Vinyl acetate monomer formation due to acetaldehyde formation, AcOH hydrogenation and posterior H2 spillover, releasing the hydroxyl groups during Vinyl acetate monomer dehydrogenation from the active site. A microkinetical model was achieved from directions of fluctuations, indicating ethylene coupling and AcOH hydrogenation to produce Vinyl Acetate Monomer (VAM). It is known that urbanization and industrialization contribute to rapidly increasing emissions of volatile organic compounds (VOCs), which are a major contributor to the formation of secondary pollutants (e.g., tropospheric ozone, PAN (peroxyacetyl nitrate) and secondary organic aerosols) and photochemical smog. The emission of these pollutants has led to a large decline in air quality in numerous regions across the world, which has ultimately led to concerns regarding their impact on human health and general wellbeing. Catalytic oxidation is regarded as one of the most promising strategies for the removal of VOCs from industrial waste streams. The review systematically documents the progress and developments made in the understanding and design of heterogeneous catalysts for VOC oxidation over the last two decades. This detailed review addresses how catalytic performance is often drastically affected by the pollutant sources and reaction conditions. It also highlights the primary routes for catalyst deactivation and discusses protocols for their subsequent reactivation. Kinetic models and proposed oxidation mechanisms for representative VOCs are also provided. Typical catalytic reactor and oxidizer for industrial VOC destruction were further reviewed. We believe that this review will act as a great foundation and reference point for future design and development in this field. Nanostructured ceramics are attractive materials that find potential uses ranging from simple everyday applications like paints and pigments to sophisticated ones such as bio imaging, sensors, etc. The inability to economically synthesize nanoscale ceramic structures in a large scale and simultaneously achieve precise control of their size has restricted their real time application. Electro spinning is an efficient process that can fabricate nanofibers on an industrial scale. During the last 5 years, there has been remarkable progress in applying this process to the fabrication of ceramic nanorods and nanofibers. Ceramic nanofibers are becoming useful and niche materials in several applications owing to their surface dependant and size dependant properties. These advances are reviewed here. The various ceramic nanofiber systems that have been fabricated so far are presented. The physical and chemical property enhancements due to the nanosize have been discussed in detail and the various applications they fit into are outlined in this article.

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