Electrospun Catalytic Support Prepared by Electrospinning Technique

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Research and development of nanofibers has attracted much attention in recent years owing to their specific and unique properties and wide potential of use in many applications such as chemistry, medical science, defense field, electronics and many others. Electrospinning has been recognized as the cheapest as well as the most straightforward way to produce nanofibers and nanofibrous materials. Electrospun nanofibrous layers seem to be promising porous carrier for the immobilized catalysts. Sufficiently high specific surface area together with generally low transport resistance can compete with the traditionally supported porous catalysts.

Our work has been focused on preparation of an electrospun catalytic support based on poly(2,6-dimethyl-1,4-phenylene oxide). A set of nanofibrous catalysts were prepared by the wet impregnation technique with the solution of platinum(II) acetylacetonate and subsequent activated by calcination in air.

On the basis of the SEM image analysis it was recognized that typical morphology of the prepared catalyst revealed predominantly the straight fibers with the mean diameter of 150 nm. The areal density of prepared nanofibrous catalysts was found to be 223 g/m^2. According to the texture properties evaluation based on nitrogen physical adsorption-desorption measurements at 77 K, high-pressure mercury porosimetry and helium pycnometry the nanofibrous supported catalysts showed porosity of 80 % with the surface area approximately 4 m^2/g.

Gas transport properties were evaluated from diffusion experiments performed in a Graham's diffusion cell which represents a modification version of well-known Wicke-Kallenbach cell. All binary counter-current gas diffusion measurements were carried out under laboratory temperature and pressure; combinations of the inert gases included argon, nitrogen and helium were utilized. It was found that diffusion resistance for all prepared catalysts is very low in comparison with most industrial catalysts.

Catalytic tests based on the total oxidation of ethanol carried out in a fixed-bed glass reactor confirmed a very good catalytic activity comparable to that of industrial catalytic systems.

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