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High activity of Pd deposited on Ag/C for allyl alcohol oxidation

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Abstract

The modification of the surface of Ag nanoparticles supported on carbon black (Ag/C) with a small amount of Pd and the electrooxidation of allyl alcohol on the Pd-modified Ag/C (Pd/Ag/C) catalysts are investigated. The Pd/Ag/C catalysts with Pd/Ag atomic ratios of 0.45–1.48:100 are prepared by electrochemically depositing Pd on Ag/C. Structural characterization by scanning electron microscopy, transmission electron microscopy, energy dispersive X-ray spectroscopy, inductively coupled plasma mass spectrometry, X-ray photoelectron spectroscopy, and electrochemical analysis reveals low loadings and small surface areas of the deposited Pd. The Pd/Ag/C catalysts are superior to Pd/C in activity for the electrooxidation of allyl alcohol in alkaline solution. When evaluated in terms of the glassy carbon substrate, Pd/Ag/C shows more negative onset potentials and peak potentials and higher peak intensities than Pd/C, although Pd/C has a relatively high activity and the Pd loadings of Pd/Ag/C are much lower than that of Pd/C. When evaluated in terms of the electrochemically active surface area of Pd or the Pd loading mass, Pd/Ag/C has great advantages over Pd/C in activity. For instance, the Pd-mass activity of Pd/Ag/C is up to nearly 200 times that of