

Structure-activity relationships of carbon-supported platinum-bismuth and platinum-antimony oxidation catalysts

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Abstract

Compositional and morphological studies on supported platinum are important for the improvement and expanded use of catalysts for oxidative coupling reactions. Nanocomposites consisting of 5% Pt supported on activated carbon and promoted with 5% Bi or Sb were prepared by electroless deposition and microwave-assisted (MW) methods. Addition of promoters significantly increases the dispersion of Pt. Bismuth reacts with residual phosphorus of the support to form various phases of BiPO_4 , while Sb cannot be detected by XRD. However, samples prepared by the MW method are unique in that they contain crystalline PtBi or PtSb alloys as part of the phase matrix. The thermal stability of the samples in air and the TOFs for the oxidation of 2-methyl-1-naphthol correlate with the metal dispersion. Since the oxidation reaction is understood to take place on the surface of metals with high standard electrode potentials, sufficient Pt exposure is one of the key performance parameters.