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Platinum-Bismuth Bimetallic Catalysts: Synthesis, Characterization and Applications

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ABSTRACT

Bimetallic catalysts have been explored and shown to exhibit unique characteristics which are not present in monometallic catalysts. Platinum is well known as an effective catalyst for oxidation and reduction reactions, and it can be made more effective when bismuth is introduced as a promotor. Thus, the effectiveness of the Pt-Bi catalyst was demonstrated in prior work. What is not clear, however, is the mechanism behind the catalyst function; why addition of bismuth to platinum decreases deactivation and increases selectivity, and how effective would the Pt-Bi catalyst be in deoxygenation reactions? In this work, the effectiveness of different variations of the Pt-Bi catalyst was explored for the deoxygenation of guaiacol. Methane was selected as the model reductant. Two Pt-Bi catalysts with different metal ratios were prepared, tested and characterized to reveal the catalyst's structure. Methods used in characterization included SEM, TEM and BET measurements. Representative catalysts were then tested in a fixed-bed reactor for performance.

KEYWORDS

Platinum-Bismuth catalyst, Guaiacol deoxygenation, Catalyst characterization, Deactivation, Methane as a reductant