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A Comparative Study of Solid Carbon Acid Catalysts for the Esterification of Free Fatty Acids for Biodiesel Production. Evidence for the Leaching of Colloidal Carbon

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Abstract

The preparation of a variety of sulfonated carbons and their use in the esterification of oleic acid is reported. All sulfonated materials show some loss in activity associated with the leaching of active sites. Exhaustive leaching shows that a finite amount of activity is lost from the carbons in the form of colloids. Fully leached catalysts show no loss in activity upon recycling. The best catalysts; 1, 3, and 6; show intitial TOFs of 0.07 s-1, 0.05 s-1 , and 0.14 s-1, respectively. These compare favorably with literature values. Significantly, the leachate solutions obtained from catalysts 1, 3, and 6, also show excellent esterification activity. The results of TEM and catalyst poisoning experiments on the leachate solutions associate the catalytic activity of these solutions with carbon colloids. This mechanism for leaching active sites from sulfonated carbons is previously unrecognized.

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