Development of Mesoporous SBA-16/SO_3H Catalysts from Sugarcane Bagasse Ash for the Biginelli Reaction

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Abstract:

This research focused on synthesizing mesoporous silica (SBA-16) from sugarcane bagasse ash, a waste material abundant in silica. To enhance its catalytic efficiency, sulfonic acid functionalization was applied, yielding SBA-16/SO_3H. Characterization techniques, including FT-IR, XRD, TEM, SEM-EDS, BET, TGA, and acid-base titration, were employed to evaluate its structural and chemical properties. The catalyst exhibited outstanding performance in the Biginelli reaction, producing high yields. Additionally, it demonstrated excellent reusability across multiple cycles with minimal loss in activity. These findings establish SBA-16/SO_3H as a sustainable, eco-friendly, and highly effective catalyst derived from agricultural waste, supporting green chemistry initiatives.

Keywords:

Multicomponent, SBA-16, Ash, Silica, Sulfonation.