Conversion of levulinic acid over Ag substituted $LaCoO_3$ perovskite

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Abstract
The present work shows the application of substituted and basic perovskites as catalysts in the levulinic acid conversion. In this context, the effect of the Ag substitution on $La_{1-x}Ag_xCoO_3$ (x = 0.00, 0.05, 0.10, 0.20) catalysts is reported. The catalysts were characterized by X-ray diffraction (XRD), specific surface area (BET), temperature programed reduction (H_2-TPR), methanol-temperature-programmed reaction (CH_3OH-TPR) and X-ray photoelectron spectroscopy (XPS) and their catalytic performance was evaluated in a batch reactor at 250 °C and 50 bar of H_2. The highest catalytic activity was obtained for the non-substituted $LaCoO_3$ perovskite attributed to a high amount of surface Co^{2+}. The post-reaction XPS characterization of the $La_{1-x}Ag_xCoO_3$ (x = 0.00, 0.05, 0.10, 0.20) perovskites indicates a partially reduction during the catalysis. The silver substitution increases the perovskites stability in reducting atmosphere, being the x_{Ag} = 0.05 the largest. In the levulinic acid (LA) conversion, an increase at shorter reaction times was detected in the formation of HPA as an intermediate followed by dehydration to form GVL. The further hydrogenation step produces pentanoic acid (PA). The presence of reduced surface cobalt species and basic sites in the Ag substituted perovskites promotes the conversion of levulinic acid and selectivity to higher hydrogenation compounds, indicative of that these mixed oxides can be used successfully in hydrotreatment reactions of biomass platform molecules.

Author keywords
Basic sites; Cobalt; Hydrogenation; Levulinic acid; Perovskite; Silver