Impedance Spectroscopy and Catalytic Activity Characterization of a La$_{0.85}$Sr$_{0.15}$MnO$_3$/Ce$_{0.9}$Gd$_{0.1}$O$_{1.95}$ Electrochemical Reactor for the Oxidation of Propene

This study aims to characterize the catalytic and electrochemical behavior of a La$_{0.85}$Sr$_{0.15}$MnO$_3$/Ce$_{0.9}$Gd$_{0.1}$O$_{1.95}$ porous reactor for the oxidation of propene in the presence of oxygen. The application of anodic polarization strongly increased the propene oxidation rate up to 71%, although the current efficiency remained low. The effect of prolonged polarization on the reactor catalytic activity was evaluated. Prolonged polarization enhanced both the reactor intrinsic catalytic activity and the electrode performance due to the formation of oxygen vacancies on the electrode surface.

Electrochemical impedance spectroscopy was used to investigate the effect of propene introduction on the reactor impedance response. The introduction of propene into reactive system caused a strong increase of electrode resistance, mainly located in the low-frequency region of the impedance spectrum. This effect was caused by the strong adsorption of propene on electrode surfaces inhibiting the adsorption and dissociation of oxygen.

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