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Electrochemical Reduction of Oxygen and Nitric Oxide on Mn-Based Perovskites with Different A-Site Cations

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Opinion

The first time, manganite-based perovskites with various A-site cations have been studied for the reduction of oxygen and nitric oxide at the temperature range of a real diesel exhaust gas. Previously, manganite perovskite-based cathodes with various A-site cations have been investigated for application as oxygen reduction cathodes. The effect can be fairly large in some circumstances. It was discovered that when different A-site cations were used in Ln 0.6Sr 0.4MnO^{3+}, the Pr-containing perovskite showed the maximum activity for oxygen reduction at a temperature of 700°C. In the open literature, no research for the electrochemical reduction of nitric oxide on perovskites with various A-site cations have been published. The experiment is carried out with cone-shaped electrodes. The advantage of cone-shaped electrodes is that they have a well-defined contact area and that the electrolyte and electrode are processed independently, preventing interaction between the electrode and the electrolyte during sintering. The results of the measurements in an oxygen-rich environment at 200°C are displayed. The activity of the La MnO^{3+} and Pr MnO^{3+} perovskites is equal, as is the activity of the $SmMnO^{3+}$ and $GdMnO^{3+}$ perovskites, which is significantly higher than that of the $LaMnO^{3+}$ and $PrMnO^{3+}$ perovskites.

The La-containing perovskites exhibit substantially higher activity than the other perovskites at this temperature, whereas the $PrMnO^{3+}$ perovskite has much lower activity. The Pr MnO^{3+} perovskite performs the worst at 400°C. When it comes to oxygen reduction, the LaMnO3+ still operates best at potentials between 0 and -0.7 V *vs*. air. The downward bend of the voltammograms on the Sm- and Gd-based manganites is stronger at low potentials than on the $LaMnO^{3+}$ perovskite, making them more active towards oxygen reduction at the very lowest applied potentials.

The perovskites have a dramatically different behaviour in a nitric oxide-containing atmosphere. The lanthanum-based manganite has a substantially higher activity than the other perovskites.

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