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Lanthanum / manganese oxide-based composites with reduced Pt load for oxygen reduction reaction

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Fuel cells, batteries, and supercapacitors are known as the most efficient and promising technologies for electrochemical energy conversion and storage. The main constrain for their production for practical use is primarily due to the high cost of materials: e.g. noble metals like platinum, as well as rather poor operational stability in different climate environments. The long-lasting challenge is to provide an advanced low-cost catalyst with performance as efficient as noble metals or better. Therefore, the rational design of novel multicomponent materials of improved catalytic properties can lead to alternatives that can compete with existing technologies.

The main objective of this research is a systematic development of advanced micro/nanostructured materials based on most used metal-oxides for ORR and metal-oxide with extremely low-loading of Pt for comparison. Hybrid composites that were compared are: MnO_2, La_2O_3, LMO and LMO-Pt. The influence of reduced amount of noble metal, as well as single oxide activity toward ORR was analyzed. The complete electrochemical performances of the hybirde materials have been done by means of CV, LSV and EIS. It was shown that all synthesized catalytic materials were ORR-active with noticeable reduction currents in O_2 saturated 0.1 M KOH. The ORR behavior indicated that La_2O_3 electrode has different mechanism than the others tested electrode materials (MnO_2, LMO and LMO-Pt). The EIS results revealed that the ORR reaction is of mixed character, being electrochemically and diffusion controlled. Even more, diffusion is of mixed character due to transport of O_2 molecule and chemical reaction of oxygen reduction. O_2 diffusion is dominant process for MnO_2, LMO and LMO-Pt electrolytic materials, while chemical reaction is dominant process for La_2O_3 electrolytic material. This ORR reaction is of particular interest because it occurs as cathodic reactions in the most of alternative energy devices.

[1] M. Varničić, M.M. Pavlović, S. Eraković Pantović, M. Mihailović, M.R. Pantović Pavlović, S. Stopić, B. Friedrich, Met., 12 (2022).
[2] S. Eraković, M.M. Pavlović, S. Stopić, J. Stevanović, M. Mitrić, B. Friedrich, V. Panić, Electrochim. Acta, 321 (2019) 134721.
[3] M.M. Pavlović, M.R. Pantović Pavlović, S.G. Eraković Pantović, J.S. Stevanović, S.R. Stopić, B. Friedrich, V. Panić, J. Electroanal. Chem., 897 (2021) 115556.