Synthesis of perovskites $LaMn_{1-x}Co_xO_3$ supported on carbon materials and their application in the oxygen reduction reaction

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Fuel cells and metal-air batteries are promising devices that can substitute the actual energy sources based on fossil fuels. However, the oxygen reduction reaction that takes place in the cathode of these devices presents sluggish kinetics, what requires a high amount of catalysts based on noble metals which are scarce and of high cost. Then, the development of alternative materials such as those based on metal oxides is an interesting alternative due to their abundance and low cost. Perovskite-based materials are promising oxides because of the flexibility of tuning their physical-chemical properties and, as a consequence, their catalytic properties. However, perovskite materials present low conductivity, so it is essential to support them on a conductive material. Carbon materials present properties such as high electrical conductivity, high surface area and low cost, which make them the ideal supports for perovskites. In addition, the interaction between perovskites and carbon materials improves significantly the activity of the electrocatalysts due to synergetic effects. In this investigation, we propose the development of perovskite nanoparticles with the formula $AB_{1-x}B'_xO_3$ supported on different carbon materials such as carbon black and multiwall carbon nanotubes. The A-site cation that presents the best performance for ORR is lanthanum due to its cation size and the highest electrical conductivity of the perovskite that contains this element. The B-site cation is occupied by transition metals such as Mn, Co, and Ni. The different combination of B cation has a positive impact on the performance of the perovskite materials. Therefore, materials based on perovskites and carbon materials are a promising alternative to the noble metal based catalysts for ORR.