Characterization of combinatorial $La_{0.8}Sr_{0.2}MO_{3\pm\delta}$ (M = Co, Mn, Fe) thin films for SOFC cathode materials

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Lanthanum-based perovskites with general formula $La_{0.8}Sr_{0.2}MO_{3\pm\delta}$ (M = Co, Mn, Fe) have been extensively used as oxygen electrodes in solid oxide fuel cells (SOFC). However, issues related with low ionic conductivity, low stability and/or incompatibility with other fuel cell components have typically limited their broad implementation. A promising approach to overcome these inconveniences has been the combination of different elements in the M site, looking for the optimum mixed properties. In this sense, this work presents a high-throughput methodology for the preparation of compositional maps of $La_{0.8}Sr_{0.2}MO_{3\pm\delta}$ by combinatorial Pulsed Laser Deposition. Many efforts and resources are usually dedicated to search for the optimum composition of a material for certain application. Opposed to that, this technique allows the fabrication of thin films with multiple compositions in a single experiment. Alternating ablation of different parent compound targets together with rotation of the substrate allows the deposition of layers with a complete and precise chemical composition distribution. This work comprises the fabrication and extensive characterization of combinatorial thin films of $La_{0.8}Sr_{0.2}MnO_{3\pm\delta}$, $La_{0.8}Sr_{0.2}FeO_{3\pm\delta}$ and $La_{0.8}Sr_{0.2}CoO_{3\pm\delta}$. The compositional and structural properties will be presented, and correlated with the electrochemical properties, with the final goal of selecting the optimum composition for its use as oxygen electrode in SOFC.