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Structural and morphological characterization of $LaCoO_3$ and $LaMnO_3$ perovskites prepared by the citrate method

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Abstract – In this work, $LaCoO_3$ and $LaMnO_3$ mixed oxides with perovskite - like structure were synthesized by the citrate method. The pH value of starting solution, temperature and the calcination time effect on structural and morphological properties of obtained oxides were studied. pH values were varied between 2 and 11 adding ammonia solution. Structure and morphology of synthesized oxides were analyzed by X ray diffraction (XRD) and scanning electron microscopy (SEM) respectively.

X ray diffraction showed that $LaMnO_3$ and $LaCoO_3$ perovskites can be obtained calcinating at 873 K in less than three hours for low pH precursors. SEM micrographs show that shape and size of crystals are affected by pH of initial solution and calcination conditions.

$LaCoO_3$ and $LaMnO_3$ mixed oxides with perovskite-like structure present nowadays an enormous interest because of their special electrical, magnetic and catalytic properties [1-3]. These materials are generally synthesized by ceramic method [4-5] and coprecipitation, however these methods require calcination temperatures higher than 1200 K and time longer than 24 hours for obtaining single phase final product. Some methods including hydrothermal, sol gel and citrate [5-6] methods have been used in order to overcome these disadvantages arising from the solid state route.

The citrate method has acquired great importance for synthesizing perovskites with better properties specially surface properties at lower calcination temperature. In this work we have investigated the influence of initial dissolution pH and calcination temperatures on the structural and morphological properties of synthesized perovskites. The pH values were varied between 2 and 11 adding ammonia solution.

The scanning electronic microscopy (SEM) studies show that shape and size of perovskite grains can be modified by variations in the temperature and calcination time and pH of precursor dissolutions. (Fig 1). Perovskites with larger surface areas were obtained at higher pH values.

X ray diffraction showed that $LaMnO_3$ and $LaCoO_3$ with rombohedral structure can be obtained calcinating at 873 K under less than 3 h for low pH precursors. Higher pH values require higher temperature and longer calcination times.

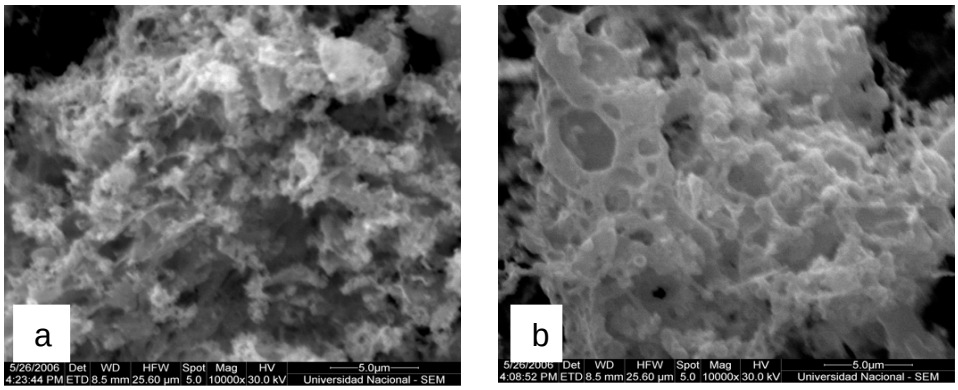

Figure 1: SEM images of the $LaMnO_3$ oxides synthesized from dissolutions, a) pH 2 and b) pH 10, calcinated at 873 K.

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