STRUCTURAL AND MORPHOLOGICAL CHARACTERIZATIONOF THE PEROVSKITE $LAFE_{0.2}CR_{0.8-X}CO_XO_3$ (X = 0.0, 0.2, 0.4, 0.6, 0.8) FOR CO SELECTIVE OXIDATION

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ABSTRACT

In order to obtain perovskites with specific structural, and morphological properties for potential applications as catalytic materials, five compositions of the system $LaFe_{0.2}Cr_{0.8-x}Co_xO_3$ (x = 0.0, 0.2, 0.4, 0.6, 0.8) were synthesized by means of a combustion technique and evaluated in methane reforming of CH_4.

The structural and morphological characterization of the calcined oxides, carried out by X-ray diffraction (XRD) (Figure 1) and electron microscopy (SEM-TEM) (Figures 2 and 3), confirmed the obtainment of a single perovskite type structure in all materials. It was noticed that the incorporation of cobalt in the structure is associated with an evolution from a rhombohedral to an orthorhombic structure with nanometric particle sizes and relevant surface properties [1, 2, 3]. From the micrographs, it is clear that the solids are made up of irregular multiparticulate aggregates, heterogeneously distributed with sizes ranging between 0.5 and 200 µm. The study showed average methane conversion values of 64.78 ± 1.08%, corresponding to obtaining 63.43 ±

1.12% for H_2 and 61.73 ± 0.99% for CO. Similarly, the expressions of catalytic reactivity, in terms of the methane conversion, the selectivities (S) towards H_2, CO and the synthesis gas ratio obtained were estimated, showing that the material has a high degree of selectivity towards the production of hydrogen and carbon monoxide, always maintaining an H_2/CO ratio> 3.0, a beneficial situation in any reforming process [4]. The conversion results as a function of temperature, shown in Figure 4, confirm that reforming is a thermally activated process, whose maximum conversion value is reached at 700 ºC.

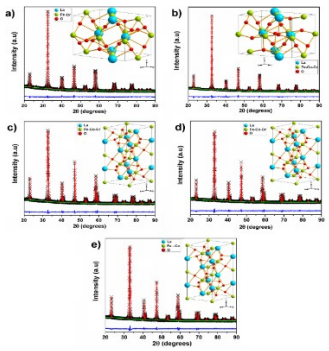

Figure 1. *Rietveld refinement of the* ***a)*** *LFM1,* ***b)*** *LFM2,* ***c)*** *LFM3,* ***d)*** *LFM4, and* ***e)*** *LFM5 samples.*

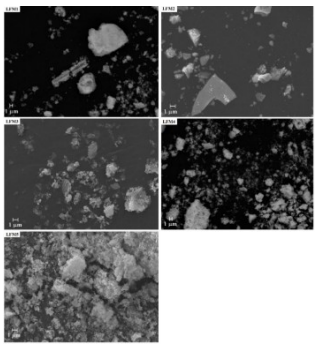

Figure 2. *Scanning electron micrographs for synthesized samples*

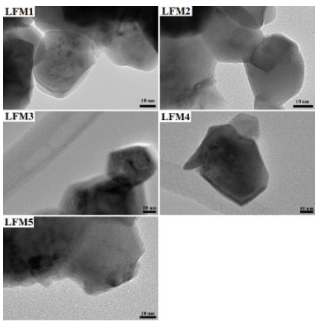

Figure 3. *Transmission electron micrographs for synthesized samples.*

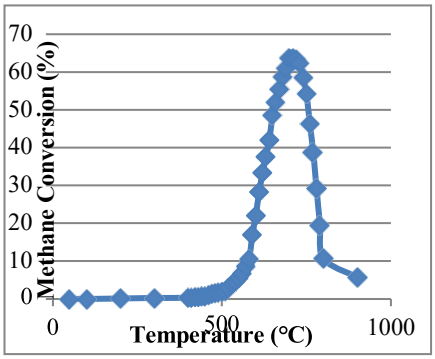

Figure 4. *Methane conversion curve as a function of reaction temperature obtained by steam reforming using the LFM5 material.*

CONCLUSIONS

Six perovskite-type materials based on the system $LaFe_{0.2}Cr_{0.8-X}Co_XO_3$ (x = 0.0, 0.2, 0.4, 0.6, 0.8) were synthesized employing a combustion method. Structural analysis using XRD, and electron microscopy showed that the oxides were single perovskite type phase. It was also noted the formation of particles with a high homogeneity and distribution, and outstanding interconnected porosity, generated in the transformation of the citrate species and the decomposition of volatile compounds. The study showed average methane conversion values of 64.78 ± 1.08%, corresponding to obtaining 63.43 ± 1.12% for H_2 and 61.73 ± 0.99% for CO, which are within the normally accepted range for studies of this type, showing that under the proposed analysis conditions, the material has a high degree of selectivity towards the production of hydrogen and carbon monoxide, always maintaining an H_2/CO ratio> 3.0.

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