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**Presentation Title:** "$La_{0.7}Sr_{0.3}BO_3$ (B=Fe, Mn, Co) perovskites as oxygen carrier materials for the preparation of dense dual phase membranes for $CO_2$ separation"

**Keywords:** CO2 separation, perovskites, CO2 capture, oxygen carriers

**Abstract (min 300 words – max 500 words):**

Carbon dioxide separation with membranes is a promising alternative method for $CO_2$ capture from the flue gases of industries. Dense dual phase membranes (combo-DP) are a new type of membranes with theoretically high selectivity of $CO_2$. They consist of a porous ceramic phase with high ionic conductivity and a molten carbonate phase that fills the pores at operating temperature. The $CO_2$ separation takes place on the ceramic surface of the membrane where a $CO_2$ molecule reacts with the lattice oxygen of the ceramic material and converts into a carbonate ion $CO_3^{-2}$. The carbonate ion can be transported through the molten carbonate phase to the other side of the membrane where the reverse reaction takes place. Perovskite materials are ideal candidates for the preparation of porous ceramic support of the combo-DP membranes, due to their ability to reversibly pick up and deliver oxygen and their high ionic conductivity. In the present work perovskites with the general formula $La_{0.7}Sr_{0.3}BO_3$ (B=Fe, Mn, Co) were studied as potential materials for the preparation of porous membranes. The perovskites were synthesized with the co-precipitation method and calcined at 1000°C. The powder samples were evaluated for their redox ability at a thermogravimetric analyzer IGA (Hiden-Isochema) with simultaneous chemical analysis of the exit stream by mass spectrometry. The evaluation was performed at constant temperature (920°C) and pressure (1050 mbar) with He as the carrier gas. The samples were reduced with $CH_4$ and oxidized with $O_2$ during successive redox cycles. The reduced and reoxidized samples were analyzed with X-ray diffraction. The analysis indicated the formation of metal oxides and $La_2O_3$ at the reduced sample, while the reoxidized samples after 8.5 successive redox cycles return to their original state indicating structure stability. The calcined powders were granulated with Polyvinyl Alcohol (PVA Merck, 1% w/v) as a binder and carbon black (CABOT, VULCAN XC72 GP-3907) was used for the pore formation. The powders were uniaxially pressed and then sintered at high temperatures achieving 25-43% porosity. A carbonate mixture was prepared by mixing and grinding $LiCO_3$, $Na_2CO_3$ and $K_2CO_3$ powders at a ratio and then infiltrated into the pores of the ceramic support. The infiltration of the molten carbonates is driven by the capillary force and the maximum filling rate achieved was 95%.

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