REDOX CHARACTERIZATION OF $LaNi_{1-x}Co_xO_3$ OXIDES FOR CHEMICAL LOOPING PROCESS

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Work-In-Progress Abstract

Chemical Looping Reforming (CLR) consists of a process that aims to convert fuel to H_2 and CO [1] using an oxygen carrier (OC) to transfer oxygen from air to a fuel such as methane, globally carrying out a partial oxidation reaction. In this context, oxides with perovskite structure are promising as OCs due to both high thermal stability and oxygen storage capacity [2]. This work proposes to develop perovskites ($LaNi_{1-x}Co_xO_3$) for chemical looping reforming of CH_4. These materials showed good catalytic performance in the traditional partial oxidation of methane [3]. $LaNi_{1-x}Co_xO_3$ perovskites (x= 0.0, 0.2, 0.5, 1.0), prepared by citrate method [4] were characterized by XRD and N_2 physisorption. Preliminary redox cyclic tests were carried out in a thermal gravimetric analyzer at 800 ºC reducing with H_2 following a sequential oxidation with air. XRD patterns of $LaNi_{1-x}Co_xO_3$ perovskite (x = 0, 0.2, 0.5, 1.0) exhibited a characteristic profile of perovskite-like phase only $LaCoO_3$ showing the formation of a small amount of Co_3O_4. All samples presented surface area in the range between 5.3 and 7.6 $m^2\ g^{-1}$ not modified by the substitution of nickel for cobalt. In-situ XRD results suggest that the reduction of the perovskites under H_2 lead to the formation of $La_2B_2O_5$ (B = Ni and Co), further transformed to $Ni_{1-x}Co_x/La_2O_3$. The preliminary redox tests indicated that in the first reduction cycle the mass loss of $LaNi_{0.8}Co_{0.2}O_3$ sample corresponds to the theoretical value. In the following cycles a limited decrease of the oxidation capacity was observed. Among the perovkites $LaNiO_3$ had a lower oxidation capacity.

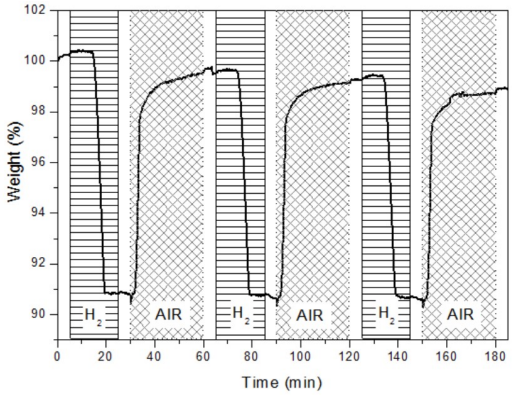

Figure 1. Redox cyles of $LaNi_{0.8}Co_{0.2}O_3$. Reducing gas: 5% H_2/N_2 Temperature: 800 ºC

References

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