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Catalytic Oxidation of 1,2-Dichloroethane on $Pr_{1-x}Ce_xBO_3$ (B= Ni/ Fe) Perovskite Type Oxides

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Abstract : The toxic nature of chlorinated hydrocarbons, to humans and environment, have led scientists all over the world to make efforts to reduce emission of such harmful compounds in air. The use of noble metals and metal oxides as catalysts for oxidation of chlorinated volatile organic compounds have long been known, the drawback being their tendency to get poisoned by chlorine. Perovskites have attracted attention due to, the compositionally diverse materials that could be prepared by substitution of A- and B-site ions, which affects their ability as a catalytic material. In the present study, cerium substituted $Pr_{1-x}Ce_xNiO_3$ and $P_{1-x}Ce_xFeO_3$ (X = 0.05, 0.1, 0.2) perovskites were prepared by co-precipitation and citrate sol-gel method. The effect of increasing cerium substitution and the effect of B-site substitution (Ni/Fe) were investigated by means of XRD, BET analysis, SEM analysis and by catalytic activity evaluation. The results of analyses reveal that cerium could enter the perovskite lattice and partially occupy the position of Pr to form $Pr_{1-x}Ce_xBO_3$ (B= Ni/ Fe) till x = 0.1. As the doping ratio increased to x = 0.2, minor phases of cerium, nickel and iron oxides appeared along with the perovskite phase. These partially substituted perovskites demonstrated good activity for oxidation of 1,2-dichloroethane. In case of $Pr_{1-x}Ce_xNiO_3$ series the activity increased for x = 0.05 and 0.1 and decreased for x = 0.2, however, it showed linear dependence on value of 'x' for $Pr_{1-x}Ce_xFeO_3$ series. $P_{1-x}Ce_xFeO_3$ showed high catalytic activity for oxidation of 1,2-dichloroethane as compared to $Pr_{1-x}Ce_xNiO_3$.

Keywords : Perovskite,1,2-Dichloroethane, Catalytic oxidation.

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