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Tuning of phosphorus content and electrocatalytic character of CeO_2-RuO_2 composite incorporated Ni-P coating for hydrogen evolution reaction

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ABSTRACT

The quantity of phosphorus content in Ni-P coating has critical influence on the performance of the coating due to the change in physico-chemical and morphological characteristics. In the present study, CeO_2-RuO_2 incorporated Ni-P coatings with optimum phosphorus content were developed by electroless nickel plating process. Tuning of the phosphorus content was achieved by varying the amount of sodium hypophosphite added in the reducing Ni-P bath. The prepared composite Ni-P electrode with optimum phosphorus content exhibited good electro catalytic behavior towards alkaline Hydrogen Evolution Reaction (HER) with an appreciable low over potential compared to bare Ni-P and the other composite incorporated Ni-P electrodes. The electrocatalytic behavior was varying depending on morphology and abundance of phosphorus in the electrode. The electrode retained its stability under the reaction conditions. The CeO_2-RuO_2 incorporated Ni-P exhibited high corrosion potential Ecorr = -0.349 V and low corrosion current density Icorr = 12 $\mu A/cm^2$ than that exhibited by pure Ni-P. Also it exerted low polarization resistance (R_p) value of 6.9216×10^4 ohm than the pure Ni-P.

Key words: Electroless coating; Corrosion; Ni-P coating; Hydrogen generation.

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