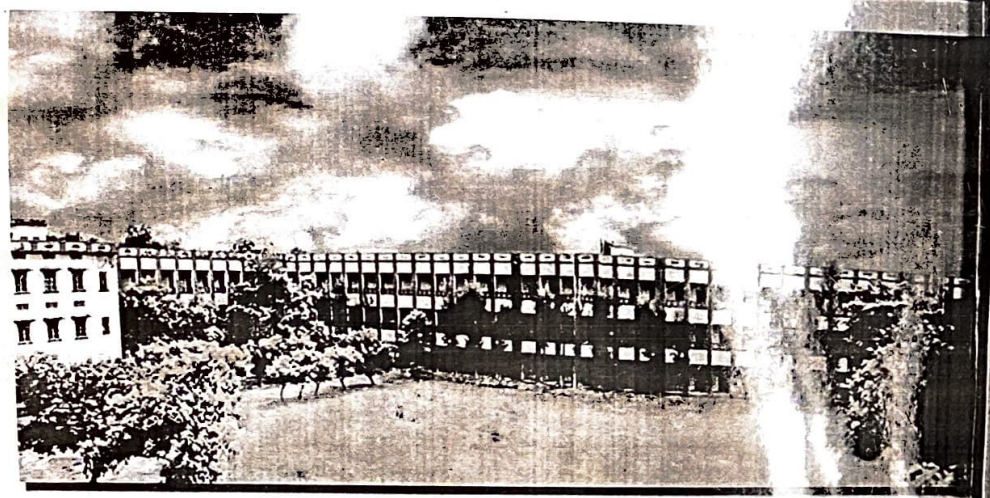

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Synthesis and applications of mixed oxide electrocatalysts for the enhancement of electrocatalytical activity of HER in alkaline media.

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Abstract

TiO_2 is a promising electrocatalyst in HER. Present work reveals the study of Fe_2O_3- TiO_2 mixed oxide electrocatalysts as a cathode for the reinforcement of Ni-P plates in HER. The composite was synthesised by thermal decomposition method using anhydrous ferric chloride and titanium isopropoxide as the precursors. All parameters including particle size of electrocatalyst, active sites, surface morphology were studied and were well characterised by SEM-EDS, EIS, FTIR and XRD patterns. The lower over potential and higher exchange current density of Ni- Co incorporated TiO_2 in alkaline media ensures by Tafel slopes. It's evident that an optimal amount of phosphorous brought a high cathodic shift and improves the electrocatalytic activity.

As compared to bulk noble metal usage, a low percentage of TiO_2 are sufficient to activate hydrogen evolution reaction by increasing current density and rate of electrolysis. Electro catalysts nature of metals can be enhanced by synergetic effect [1] and increasing the real surface area of electrodes [2]. In alkaline media HER proceeds through 3 steps as follows

1. Volmer reaction (Initial proton discharge to form an adsorbed H atom on metal surface).
2. Heyrovskyreaction (Electrochemical desorption of hydrogen).
3. Tafel reaction (chemical desorption by the recombination of adsorbed H atoms).

Fe_2O_3-TiO_2 mixed composite was developed by thermal decomposition method. The reactants used are anhydrous $FeCl_3$, $(Ti(ipr)_4)$. The required amount of these were prepared in isopropanol, and kept at room temperature for 4-5 hours with constant stirring and evaporated to dryness in a China dish followed by heating at 120 °C for 1 hour in an oven.