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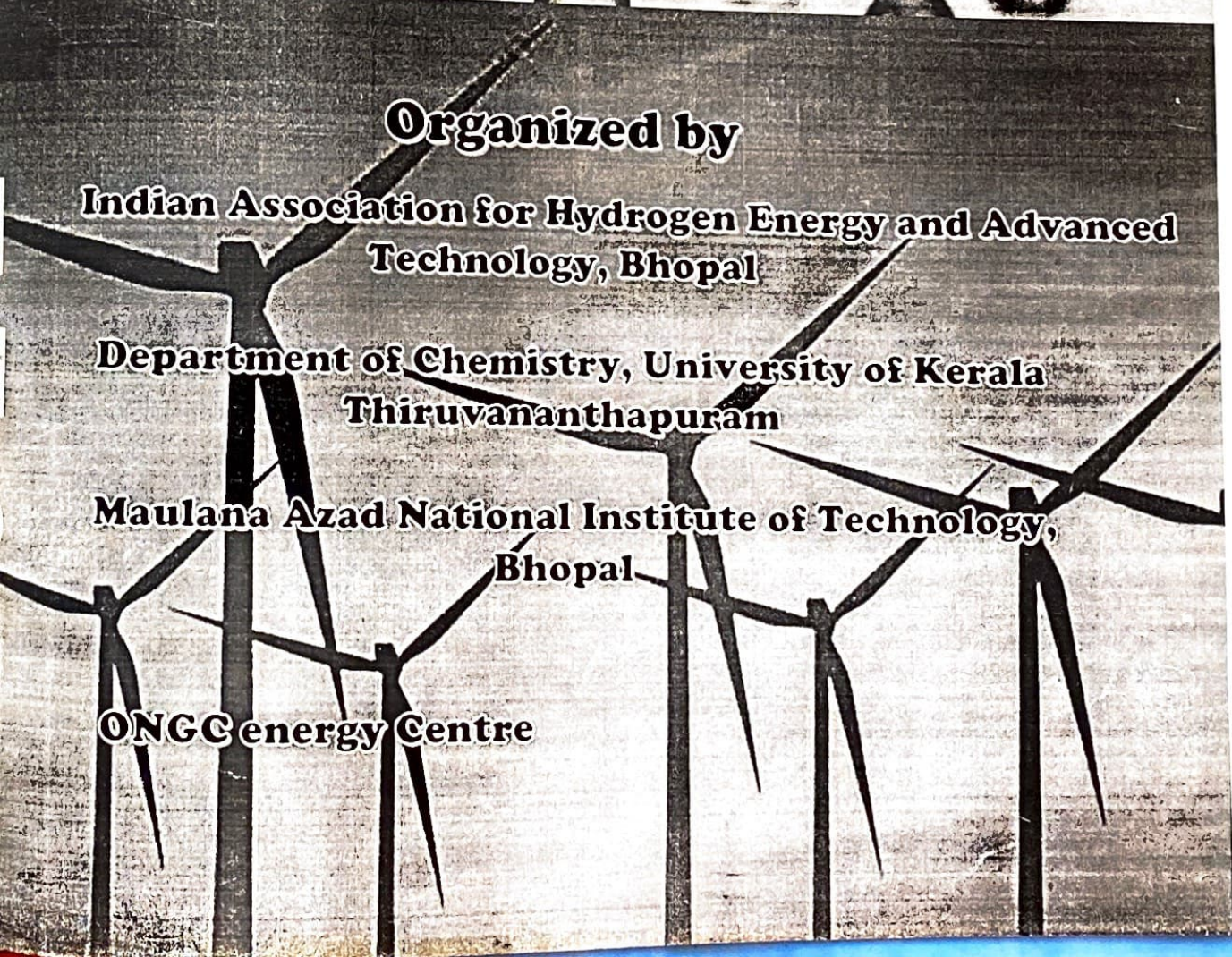
Abstract



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Synthesis and electrochemical applications of Pd/TiO_2 integrated graphene oxide 3D heterostructures

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The hydrogen transition offers a new pathway to achieve the successive goal of a carbon-neutral economy, because hydrogen as carbon-neutral energy vector which is pivotal for most of the energy demand technologies such as fuel cell for generators and engines, fertilizer industry, hydrocarbon productions. Hydrogen production through a greener and safer technology was needed to reduce CO_2 reduction for environmental remediation. Therefore, hydrogen production from water as primary source, which offers a wider flexibility and environmental compatibility. Due to the high overpotential for HER, hydrogen production from water electrolysis needs high energy consumption, to reduce this difficulty synthesis of new range of tunable, efficient and favorable market price catalysts was worth-full. For this purpose, a new novel strategy can be envisaged to design a 3D catalytic heterostructure which offers selective water dissociation, proton reduction and followed by electron translocation. To satisfy the demands, 3D graphene oxides was employed as the prominent materials because of its large surface area, electrical conductivity and stability to wide pH conditions.

Structural charecterization of the prepared oxidised GO supported electrocatalysts was done by using STEM and HRTEM analysis. The 3D structure integrated with oxide particles was however confirmed by FTIR analysis. The temperature dependant phase transformation and stability were evaluated by SAXRD and TG/DSC analysis. Electrocatalytic performance of HER was investigated by linear sweep voltametry (LSV) and chronoamperometry (CA) in deaerated buffer conditions under N_2 atmosphere. The HER kinetics at variable overpotential were evaluated using EIS analysis. The enhanced electrocatalytic activity and the kinetic behaviour of prepared catalyst were studied using Tafel polarisation curves.

Keywords: Eletrocatalyst, Water splitting reactions, Hydrogen evolution.