1. **This submission is for Poster presentation**
2. **The targeted symposiums are B**

Enhancement of Hydrogen Evolution Reaction Performance of 3D Pyrolytic Carbon derived from 3D Printing

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Considering its clean and fully recyclable nature, hydrogen generated through water electrolysis is a potential alternative to fossil fuels. However, the ability of hydrogen to hold the next-generation fuel capability is affected by the unaffordability of the water electrolyzer systems and practical-level electrochemical performance. Moreover, the oxygen evolution reaction remains enigmatic in the overall water-splitting reaction.[1] Recently 3D printing additive manufacturing technology has been explored for electrochemical applications including hydrogen evolution.[2] This work involves the fabrication of polymer template-based electrode using stereolithography (SLA). The main novelty of the work lies in using a Rod-Connected Diamond-based geometry, i.e. whose topology is similar to that of an atomic diamond crystal, where bonds between atoms are represented by cylinders. According to literature, the electrode activity can be improved by increasing and optimising the active surface area and the intrinsic activity of the material. Hence printable 3D polymer structures with different filling fractions can be designed and subsequently analysed for material and electrochemical performance. The post-processing involves carbonizing the polymer template through thermal decomposition followed by nickel electroplating and chemical vapour deposition of g-C_3N_4 with the purpose of obtaining nitrogen-carbon-nickel hybrid electrode-electrocatalyst system. The electrochemical performance of the electrocatalyst has been analysed via techniques such as voltammetry, electrochemical impedance spectroscopy and chronoamperometry. The analysis revealed that the intrinsic activity of the pyrolytic 3D carbon has been improved by incorporating nickel and carbon nitride. Furthermore, electrocatalysis in terms of improved current density has been observed with increased surface area of the electrode. Moreover, the electrocatalyst materials have been characterized via techniques such as X-ray diffraction, scanning electron microscopy, energy-dispersive X-ray spectroscopy and Raman spectroscopy. This work further involves the analysis of hydrogen evolution reaction performance at different pH levels.

References

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References (Times New Roman, 12 pt, American Medical Association (AMA) style, see below for example)

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