Seminar

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Institute for Plasma Research

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Title: Improving Electrolytic Conditions for Efficient Hydrogen Generation through Plasma Electrolysis

Speaker: Dr. Debashrita Mahana
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Date: 30th Jun 2026 (Monday)

Time: 11:00 am

Venue: Seminar Hall, IPR

Abstract: Plasma electrolysis, also known as Contact Glow Discharge Electrolysis (CGDE), is an alternative and promising technique for water splitting, wherein a self-sustained plasma is generated at the electrode-electrolyte interface under high voltage conditions. This emerging approach has shown significant potential in diverse applications, including the synthesis of nanomaterial, alkali processing, wastewater treatment, and notably, industrial-scale hydrogen production [1, 2].

The primary objective of this study is to explore the feasibility of plasma electrolysis for hydrogen generation by systematically investigating the influence of electrolyte concentration. Specifically, we examined the effect of potassium hydroxide (KOH) concentration ranging from 0.01 M to 0.2 M on the discharge characteristics and gas evolution behaviour. Key parameters such as current-voltage (I-V) response and electrolyte conductivity were recorded. The results indicate that higher electrolyte concentrations lead to increased conductivity, which in turn reduces both the breakdown and discharge voltages, measured at a constant cathode immersion depth of 1 cm. At an optimal concentration of 0.15 M KOH, hydrogen generation reached a maximum of 574 mL/min. Gas chromatography (GC) analysis confirmed the composition of the evolved gas to be approximately 95% H2, with minor traces of oxygen and hydrocarbons. Importantly, the system demonstrated stable operation for up to one hour under continuous run. Additionally, efforts are made to understand the reaction kinetics during the plasma electrolysis process. These findings underscore the effectiveness of plasma electrolysis as a green and efficient method for hydrogen production, with potential implications for reducing greenhouse gas emissions in future energy systems.

References:

[1] S. Bespalko and J. Mizeraczyk, Energies 15, 7508 (2022)

[2] K. Rottach, G. Lang, M Gastaldi, C. Gerbaldi, M. Bonomo, Electrochem. Commun. 153, 107542 (2023)