Key Note Address
World Hydrogen Energy Summit 2023, 16-17 October 2023, Delhi, India

Strategies to accelerate the energy transition using next-generation electrolyser technologies for green hydrogen

Presented By: Rajesh Mehta

Senior Consultant, Energy and Materials Transition, TNO, The Netherlands

Email: Rajesh.mehta@tno.nl, LinkedIn: https://nl.linkedin.com/in/rajeshmehta81

https://www.voltachem.com/

Companies, research organisations, and industry consortiums are experimenting with megawatt-scale electrolysers to produce green hydrogen to support the ambition of installing 40+ GW of electrolyser production capacity by 2030 in Europe only. Four technologies are available for green hydrogen production using water electrolysis: AEM, SOE, PEM and Alkaline. Each technology has its advantages, disadvantages and maturity level (TRL). Three main research challenges exist for all four technologies- 1) reducing high capital intensity associated with the system, 2) improving system efficiency, and 3) overcoming barriers to large-scale production. TNO, an independent research organisation, is addressing these three challenges by applying a systemic approach to technology development, ecosystem and technology value chain development, infrastructure, conversion and end-use applications of green hydrogen. TNO's green hydrogen activities aim to 1) deliver technical, social and policy innovations to accelerate the development of hydrogen as a fuel and as an industrial chemical as part of the energy and materials transition and 2) promote the emergence of public-private green hydrogen ecosystems such as manufacturing, e.g. Electrolyser Makers Platform, industrial electrification, e.g. Voltachem programme, and offshore system integration using hydrogen, e.g. North Sea Energy programme.

Although green hydrogen is an essential element in the energy transition, concerns regarding large-scale electrolysers' capacities limit the use of critical raw materials, thereby impacting the materials transition and the circular economy ambitions. TNO analysis[1] estimated that in a high hydrogen demand scenario in 2050, ~110% of the world's annual iridium supply would be needed by Europe to produce and service PEM electrolysers. To address the issue, TNO is extensively researching optimising next-generation electrolysis technology. For instance, TNO has succeeded in developing PEM electrolysis cells that require 200 times less iridium than conventional cells. Besides iridium, the European green hydrogen demand in 2050 would require ~30% of the global annual tantalum and ~25% of the global annual platinum supply. The EU Commission classifies both as critical raw materials for the EU. The presentation will also show example case studies on the new generation of electrolysis with a circular design, greater efficiency, and lower costs to counter the scarcity of other raw materials. Finally, the presentation will share strategies to accelerate the energy transition by addressing the roadblocks to developing large-scale electrolysers technologies for producing green hydrogen.

---

[1] Source: TNO (2021), Part 1 - How raw materials scarcity can hinder our ambitions for green hydrogen and the energy transition as a whole (link), Part 2 - How we can prevent the scarcity of raw materials and achieve our ambitions for green hydrogen (link)