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**Literature Seminar**

When: October 16, 2023
Time: 3:00 p.m.
Location: CBLL-16

# Water Electrolysis Technologies and Challenges

**Abstract:**

The demand for green and economical hydrogen production is increasing progressively due to the global warming. Although there are various methods for hydrogen production, water electrolysis is a green route for hydrogen production. Water electrolysis consists of two main reactions- hydrogen evaluation reaction (HER) and oxygen evaluation reaction (OER). Moreover, water electrolysis is carried out in different conditions-acidic, basic, low temperature and low high temperature. So far, alkaline water electrolysis (AWE), proton exchange membrane water electrolysis (PEMWE) and solid oxide water electrolysis (SOWE) are available for the hydrogen production. Among them, alkaline water electrolysis and PEM water electrolysis have mature technology to produce hydrogen on industrial scale. To reduce the production cost of hydrogen, the constituents of the AWE and PEMWE need to be improved. Each electrolyzer possesses electrodes, electrocatalysts, membrane, gas diffusion layer and bipolar plates. Among these parts, electrocatalysts and membrane are the prime components for the improvement of the efficiency and economic feasibility of the water electrolyzers. To improve the efficiencies and sustainability of the electrolyzers, these materials are being vigorously explored on industrial conditions as there are differences in operating conditions between laboratory and industry. Durable and highly conductive membrane are being developed by functionalization of the polymer. Doping, defect engineering, heterostructure engineering, and modulation of interface are the techniques that are used for the development of the cost-effective, efficient, stable electrocatalysts for HER and OER of the electrolyzers. In the end, both current challenges and future directions on the development of both the alkaline water electrolyzer and the proton exchange membrane water electrolyzer are outlined.

**References:**

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