NanoLab Talk

Politecnico di Milano, Department of Energy, Cesnef (Building 19), via Ponzio 34/3, Milan
Seminar Room 1° floor

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Earth-abundant Metal-metalloid Materials as Efficient Oxygen-Evolving Electrocatalyst

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Electrochemical energy conversion and storage devices including metal-air batteries, regenerative fuel cells, and water-splitting cells are critical to satisfy the future energy demand of human society. Though electrochemical water splitting technology is well-established as a clean and efficient technology for hydrogen production because of the possibility of coupling to renewable sources of energy, such as solar and wind, it is still limited by sluggish anodic oxygen evolution reaction (OER). As this particular electrochemical reaction is also involved in many energy storage and conversion technologies, it has become a hot topic over the last decades. Precious metal-based catalysts such as oxides of Iridium and Ruthenium and metal-composites are used predominantly, but the scarcity and low stability limit their application at large scale. As a consequence, intensive efforts have been devoted to developing cost-effective catalysts with superior oxygen-evolving activity and catalytic stability. The earth-abundant metal-metalloid materials represent an emerging family of highly efficient oxygen-evolving catalysts due to their ability of charge transfer between constituent elements and modified electronic structures lowering the kinetic energy barriers of the electrochemical process. Herein, the scientific approach to tune in the electrochemical properties of transition metal-based metal borides for energy storage and conversion technologies will be presented. The approach includes, but is not limited to the study on (1) synergistic effect in metal borides, (2) supporting catalysts on carbon nanomaterials, and (3) morphological tailoring ranging from nanoparticles to nanosheets.

About the speaker:

Mr. Nsanzimana is a Research Assistant at Nanyang Technological University (NTU). He was a Ph.D. candidate with a Singapore International Scholarship Award (SINGA) from Aug. 2015 to 2019 at NTU, Singapore. He received his MSc degree in Applied Chemical Engineering, Kyungpook National University, South Korea. He completed his undergraduate studies with a First Class Honour. His research interest is in the field of nanostructured functional materials and their application in sustainable energy and clean environment technologies including water splitting, fuel cells, batteries, and carbon dioxide conversion. He published over 10 peer reviewed papers in international journals of Chemistry and Materials science such as Adv. Energy Mater., Adv. Mater., and Nat. Energy.

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