

Deployment of Circular Economy Technologies Towards Net-Zero Emission Plastics Industry

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Abstract

Plastic wastes (including microplastics) have aroused remarkable attentions due to its severe impacts to the ecosystem and human health. Plastics industry is also a sector with heavy CO₂ emissions. Circular economy technologies can effectively reduce the loading of waste management while contributing to a certain amount of carbon dioxide reduction through avoidance of virgin materials and/or generating renewable energy and chemicals. In this presentation, we will briefly introduce the concept of the net-zero emission, and its relationship with plastics industry. We will also discuss the important principles of a circular approach (such as chemical recycling) to realizing a net-zero plastics industry. We will provide two cases: (1) gasification of plastics wastes to produce syngas, combined with a subsequent electrochemical CO₂ reduction process, and (2) electrokinetic separation of wastewater (such as a recycled-PET bottle washing process) from plastics industry to produce alkaline and acid chemicals with water reclamation. Lastly, we will point out several priority research directions for achieving a net-zero plastics industry from the aspects of energy, engineering, economics and environment. This presentation could provide an insight into the



green research on green alternative waste management strategies for plastic wastes around the world.

Biography

Shu-Yuan Pan received his Ph.D. from the National Taiwan University (2016) in environmental engineering. He served as a visiting researcher at Argonne National Laboratory and conducted postdoctoral research at Lawrence Berkeley National Laboratory. In 2019, Dr. Pan joined National Taiwan University as a tenure-track Assistant Professor. He is dedicated to developing green circular processes for wastewater valorisation as a new resource and source of energy. Pan has published >90 SCI articles (Google citation > 5000; h-index 39) and has received 8 patents. He was awarded the “2022 ACS Sustainable Chemistry & Engineering Lectureship Award” (USA) for his achievements in green separation for a circular water economy. Pan was named in “World’s Top 2% Scientists” in 2020 and 2021. In 2020, he received the Most Cited Paper Award (Elsevier), and the prestigious Einstein Fellow (Taiwan). In 2013, he was named “Green Talent” by BMBF (Germany) for his work advancing green technology.