

Monitoring, Control and Assessment of Plastic Wastes: A Life-cycle Thinking for Circularity

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Abstract

Plastic wastes in the natural environment have aroused significant attentions around the world due to its severe impacts to ecosystem and human health. In particular, microplastics (or nanoplastics) in combination with toxic contaminants would be transferred through the food chain via bioaccumulation, thereby potentially affecting food safety and human health. In this research, we will provide an overview on the current situations of global plastic wastes. Then, we will discuss the key elements in monitoring, control and assessment of plastic wastes from a life-cycle thinking. For instance, in the case of monitoring, we will illustrate the methodology of thermal analyses, such as thermogravimetric analysis, for quantifying the microplastics in real waterbodies. We will also discuss the reuse and recycle of plastic wastes from both theoretical considerations and practical applications, thereby realizing circular economy system. Lastly, we will point out the priority research directions for microplastics monitoring, control and assessment, including (i) development of standardized and robust methods for sampling, characterization and quantification of microplastics in water, sediments and biological tissues, (ii) development to effective strategies and technologies for control and removal of microplastics, (iii) evaluation of occurrence, behaviors and fate of microplastics at global scale concerning their



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long-terms effects to ecosystems, and (iv) thorough assessment of health and ecological risks in different environmental matrices. This study will provide an insight into the green research on renewable alternatives and/or alternative waste management strategies for plastic wastes.

Keywords: Plastic Wastes, Toxic Contaminants

Biography

Shu-Yuan Pan is currently an assistant professor at Department of Bioenvironmental Systems Engineering, National Taiwan University. He received his PhD degree in Environmental Engineering from National Taiwan University. He was included in the list of “World’s Top 2% Scientists” in the field of Earth & Environmental Sciences (2020); and was awarded the “Young Scholars Fellowship (the Einstein Program)” by the Ministry of Science and Technology, Taiwan (2019); the “Honorary Member” by the Phi Tau Phi Scholastic Honor Society (2016); the “Green Talents Fellow” by BMBF, Germany (2013). His current research group focuses on the GREAT (Green Research for Environmental and Agricultural Technologies) work. He has published more than 80 SCI-index Journal articles with a total citation of >3700 times and an h-index of 32 (Data on September 2021 from Google Scholar). He holds 7 issued patents and 4 pending patents.