Selective separation of hazardous chlorinated plastic by combined treatment of hydrogen peroxide and ultrasonic irrigation

Byeong-Kyu Lee, Nguyen Thi Thanh Truc and **Hayeong Kim**
University of Ulsan, Korea

A large portion of municipal plastic wastes consists of significant amount of polyvinyl chloride (PVC) products containing hazardous chlorine element. During their disposal activities such as incineration, a lot of toxic chemicals including hydrogen chloride, chlorine gas, dioxins and furans can be released into environment. Therefore, proper development of selective separation methods of PVC containing chlorine is necessary before applying disposal or material recycling processes. However, it has been difficult to separate selectively PVC from mixtures of plastics having similar appearance density i.e. PVC and PET mixture (PET 1.38 g/cm^3 and PVC 1.42 g/cm^3). This study presents a one-step selective separation technique of PVC using H_2O_2 solution to promote hydrophilicity development on PVC surface under ultrasonic irrigation. The ultrasonic treatment helped to decrease air bubbles attachment on PVC surface which can make settling down of treated PVC to the bottom of the flotation reactor. However, the PET treated under the ultrasonic environment was easily floated over because it was still kept hydrophobicity. The combined treatment of low concentration of H_2O_2 and ultrasonic irrigation for 30 min showed 100% purity and recovery of the PVC separated from PET which could be a suitable and inexpensive way to improve plastic recycling quality through selective separation of PVC with selective building of hydrophilicity on PVC surface.

Biography

Byeong-Kyu Lee is a Professor of Civil and Environmental Engineering at the University of Ulsan (UOU), Ulsan, Korea. He is the Director of Brain Korea 21 Project and Environmental Industry and Education Center at UOU. He received a Service Merit Medal of Korea from Korean Government and an outstanding Professor Award from AWMA. He also received a Professor Award of the Year and a distinguished Professor in Research Award at UOU. His current research interests include visible light driven photocatalytic treatments of organics and VOCs, photocatalytic CO_2 conversion into solar fuels, photo-electrochemical H_2 production, CO_2 sequestration using nano zeolites and nanocomposites, adsorption removal of organics and heavy metals, carbon aerogel and bead and biochar application. He also has great interest in air pollution and particle control as well as self-cleaning fiber and selective plastic separation from ASR and ESR with surface treatments.

bklee@ulsan.ac.kr

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