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Removal of textile microfibers from water streams by air flotation

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The presence of textile microfibers in our waterways, oceans, sediments, air, and food chain is an emerging issue of which long-term ramifications are not known. Textile microfibers released during home laundering, use, and disposal can significantly contribute to microplastic pollution and are an important environmental issue. Most studies report synthetic microfibers (microplastics) such as polyethylene terephthalate (PET), nylon, and acrylic. Nevertheless, recent studies have also found important amounts of cellulosic and other natural textile fibers in different environments.Wastewater treatment plants (WWTP) are not designed for microplastics removal, but they have a high removal capacity (>98%). Nevertheless, tiny particles and microfibers (< 100 μm) are still released with the effluents. Moreover, there is evidence that both synthetic and cellulosic textile microfibers are present in the WWTP effluents. Besides, the persistent microplastics stay in the sludge that is commonly used as fertilizer. In this study, the goal was to assess the feasibility of using air flotation technologies to remove textile microfibers from water streams. Acrylic, cotton, polyester, and nylon microfibers were produced with controlled size distribution using a Wiley mill. Natural fibers such as cotton were considered even though they are not plastics because they represent a significant volume of textile production. In addition, cotton fibers have different surface chemistry than synthetic fibers due to their nature and the functional finishes commonly applied to improve their properties. The air flotation experiments show that even without using foaming agents, synthetic textile microfibers such as polyester, nylon, and acrylic are removed from water by the air bubbles, > 40% removal efficiency. On the other hand, for hydrophilic fibers such as cotton, the foaming agent must be added to achieve effective removal (>50%). In addition, it was observed that the size of the microfibers affects the removal efficiency of cotton microfibers which can be related to the surface hydrophilic and net negative charge of these microfibers.

Biography

Marielis Zambrano hold a PhD in Forest Biomaterials and a bachelor's degree in Chemical Engineering. She have experience in research development, project management, sustainability, and circular economy.The sustainability world intrigued me, and She is very much believe in the value and importance of this area. As a Ph.D. student, her research area relates to an environmental sustainability hot topic -- the plastic contamination in aquatic environments, specifically, microplastics or microfibers shed during the laundering of textiles. During my research, She have learned about the effects of plastics in the environment and the opportunities in the industry to promote the circular economy. Her immediate career goal is to apply the knowledge obtained during my career in industry and academia to create solutions to plastic pollution.

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