

Treatment of dairy wastewater using hybrid techniques based on ultrasonic cavitation and membrane filtration

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Many studies have conducted using ultrasound as a means of mitigating membrane fouling over the last decade and to improve the cleaning of fouled membranes [1]. Ultrasound has been comprehensively accepted as a powerful method for the cleaning of fouled membrane in water treatment and it has been regarded as efficient technique in membrane filtration as well as membrane cleaning of fouled membranes to enhance the permeate flux [2]. Ultrasound irradiation generates a number of physical forces, what can be generated by the alternating compression and rarefaction cycles, like vibration and physical agitation. In Figure several different mechanisms of ultrasound are shown which may lead to particle release from a particle-fouled membrane surface, including cavitation mechanisms, microstreaming, acoustic streaming and micro-jets.

Novel wastewater treatment is necessary to effectively decrease the organic load of dairy wastewater before disposal [3]. In this work the efficiency of the advanced hybrid process, for purification of dairy wastewater, that apply ultrasonic irradiation and a pressure-driven membrane ultrafiltration process was investigated. Permeate fluxes, relative fluxes, chemical oxygen demand membrane rejections and membrane, gel-layer and inner porous fouling resistances were analyzed and compared in single and combined processes. Furthermore, to understand the fouling mechanisms in depth, the influence of the membrane fouling on the contact angle results was also investigated.

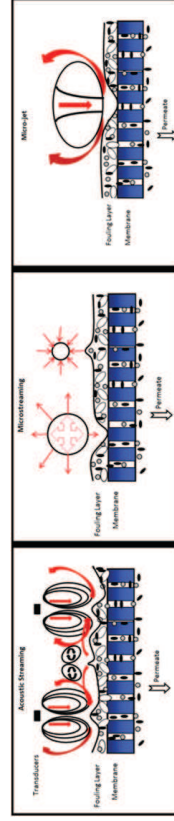


Fig. 1 Mechanisms for particle detachment during ultrasonic membrane filtration

Keywords: dairy wastewater; ultrafiltration; hybrid processes; fouling

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