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Extraction and Quantification of Triclosan in Wastewater Samples Using Molecularly Imprinted Membrane Adsorbent

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Abstract : This paper reports on the successful extraction and quantification of an antibacterial and antifungal agent present in some consumer products (Triclosan: $C_{12}H_7Cl_3O_2$)generally found in wastewater or effluents using molecularly imprinted membrane adsorbent (MIMs) followed by quantification and removal on a high-performance liquid chromatography (HPLC). Triclosan is an antibacterial and antifungal agent present in some consumer products like toothpaste, soaps, detergents, toys, and surgical cleaning treatments. The MIMs was fabricated usingpolyvinylidene fluoride (PVDF) polymer with selective micro composite particles known as molecularly imprinted polymers (MIPs)via a phase inversion by immersion precipitation technique. This resulted in an improved hydrophilicity and mechanical behaviour of the membranes. Wastewater samples were collected from the Umbogintwini Industrial Complex (UIC) (south coast of Durban, KwaZulu-Natal in South Africa). central UIC effluent treatment plant and pre-treated before analysis. Experimental parameters such as sample size, contact time, stirring speed were optimised. The resultant MIMs had an adsorption efficiency of 97% of TCS with reference to NIMs and bare membrane, which had 92%, 88%, respectively. The analytical method utilized in this review had limits of detection (LoD) and limits of quantification (LoQ) of 0.22, 0.71µgL-1 in wastewater effluent, respectively. The percentage recovery for the effluent samples was 68%. The detection of TCS was monitored for 10 consecutive days, where optimum TCS traces detected in the treated wastewater was 55.0µg/L inday 9 of the monitored days, while the lowest detected was 6.0µg/L. As the concentrations of analytefound in effluent water samples were not so diverse, this study suggested that MIMs could be the best potential adsorbent for the development and continuous progress in membrane technologyand environmental sciences, lending its capability to desalination.

Keywords : molecularly imprinted membrane, triclosan, phase inversion, wastewater
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