Desalination and Water Treatment
www.deswater.com
doi: 10.5004/dwt.2021.27579

241 (2021) 35–39
November

Synthesis and application of molecular imprinted polymers for online monitoring of textile dyes in wastewater

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Received 26 August 2021; Accepted 23 September 2021

ABSTRACT

A large quantity of dyes is being used in different industries like textile, leather, tanning, paper, plastics, food, cosmetics and printing, etc. which cause water pollution. The impedance of water pollution has special implications for both human life and livestock. Different spectroscopic and chromatographic techniques are used to determine the concentration of dyes. However, these techniques are expensive due to the cost of instruments and time-consuming with regard to sampling and sample preparation. In the present research project, selected dyes in industrial wastewater were quantified and online-monitored via molecularly imprinted polymers. For this purpose, polystyrene and polyvinylpyrrolidone and their composite with graphene oxide were synthesized. These sensors layers were combined with mass-sensitive transducer-quartz crystal microbalance. The composite of polyvinylpyrrolidone with graphene oxide showed 2.5 times better sensor response than its molecular imprinted polymers. The polystyrene composite with graphene oxide showed 13 times better sensor response as compared to its molecularly imprinted polymers. The composite of polyvinylpyrrolidone with graphene oxide have lesser response toward selected dyes (methyl red and methyl orange) as compared to polystyrene composite with graphene oxide. Especially the sensitivity of molecular imprinted polymer-based composite sensors is detected up to 5 ppm toward selected dyes in industrial wastewater.

Keywords: Molecular imprinted polymer; Vinyl pyrrolidone; Polystyrene; Ethylene glycol dimethacrylate; 2,2-azobis isobutyronitrile; Quartz crystal; Microbalance

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