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Separation and retention of some textile dyes in natural water employing polyurethane foams

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In recent years, the growth of the human population of the world causes not only serious problems of food and resources, but also brings the encroachment of the natural ecosystem. Thus, with a heightened sense and increased awareness of environmental responsibility comes a need for removal or minimizing the organic pollutants in industrial wastes. Industrial wastes in the form of solid, gas and liquid effluents represent one of the most serious problems of environmental pollution and necessitate strict control and appropriate treatment processes. The resilient open cell polyurethane foam represents an efficient separation and preconcentration medium for the investigated textile dyes in diluted aqueous solutions. The kinetics, mechanisms and thermodynamics characteristics of the sorption steps of the dyes onto polyurethane foam are also considered. The proposed methods permit rapid and effective separation of sandolane dye from water samples at relatively high flow rate without loss in column performance. Overall, the results of this study provide a deeper insight into the mechanism of extraction of some textile dyes by polyurethane membrane and show that the PUFs membrane has a considerable potential in commercial applications for removal of some textile dyes from industrial effluents.

The applicability of the proposed foam column method for quantitative collection and recovery of sandolane from natural and underground water as a case study was critically investigated. A one liter of tap or underground water sample spiked with sandolane at 1-5 μg/cm^3 concentration level was percolated through the foam column at 10 cm^3/min flow rate. More or less complete extraction of the tested dye was achieved quantitatively as indicated from the effluent solutions. The retained species were also successfully recovered with 50 cm^3 acetone at 5 cm^3/min flow rate. The breakthrough curves of sandolane spiked to tap and underground water samples are presented in Fig.1. The results revealed excellent extraction 98% and recovery percentages even if samples contain high content of dissolved solids.

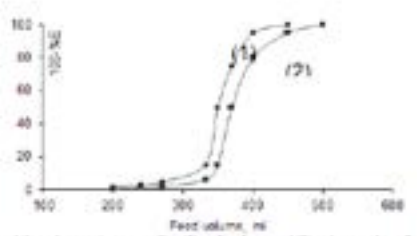

Fig. 1: Breakthrough capacity curves of tap (1) and underground (2) water samples spiked with sandolane (1 ppm) onto unleached PUF packed column at 10 cm^3 mean flow rate and 25± 0.5°C

Recent Publications:

1. Lucyna Bilińska, Kazimierz Blus, Marta Gmurek, Stanisław Ledakowicz (2019) Coupling of electrocoagulation and ozone treatment for textile wastewater Reuse Chemical Engineering Journal 358:992–1001.

2. Simone Haslinger, Sami Hietala, Michael Hummel, Sirkka Liisa Maunu, Herbert Sixta (2019) Solid-state NMR method for the quantification of cellulose and polyester in textile blends Carbohydrate Polymers 207:11–16.

3. Ridha Lafi, Lassaad Gzara, Ramzi Hadj Lajimi, Amor Hafiane (2018) Treatment of textile wastewater by a hybrid ultrafiltration/electrodialysis Process Chemical Engineering & Processing: Process Intensification 132:105–113.

4. Aseel M. Aljeboree, Abbas N. Alshirifi, Ayad F. Alkaim (2017) Kinetics and equilibrium study for the adsorption of textile dyes on coconut shell activated carbon Arabian Journal of Chemistry 10, S3381–S3393.

5. Ayesha Wasti, M. Ali Awan (2016) Adsorption of textile dye onto modified immobilized activated alumina Journal of the Association of Arab Universities for Basic and Applied Sciences 20:26–31.

6. Mohammadine El Haddad, Rachid Slimani, Rachid Mamouni, Saı¨d ElAntri, Saı¨d Lazar (2013) Removal of two textile dyes from aqueous solutions onto calcined bones Journal of the Association of Arab Universities for Basic and Applied Sciences 14:51–59.

Biography

Ahmed Talaat Tawfik has diverse experiences in environmental control and treatment. He has worked in Egyptian Environmental Affairs Agency since 2000 as environmental researcher and have several papers in environmental treatment. Ahmed Talaat Tawfik has established environmental system management for different organization to implement, monitor and control the environment in Egypt and UAE. Dr Ahmed Talaat Tawfik has received many appreciation awards from Egyptian minister and UAE ministers.

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