REMOVAL OF SELECTED ENDOCRINE DISRUPTING COMPOUNDS FROM SECONDARY EFFLUENT BY ADSORPTION ON A POLYMERIC RESIN

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Endocrine disrupting compounds (EDCs) are chemicals, natural or synthetic, which can affect the endocrine system of human, wildlife and aquatic organisms [1]. Pharmaceuticals, personal care products and plastics are the main sources of EDCs in the environment. EDCs enter municipal wastewater mostly through human use. Elimination of the majority of the endocrine disrupting compounds during wastewater treatment is often insufficient resulting in contamination of natural water bodies [2].

This study examined the removal of selected endocrine disruptors (estrone, 17β-estradiol, ethinylestradiol, norethindrone, androsterone, stanolone, Bisphenol A, 2,4-Di-tert-Butylphenol, carbamazepine, iminostilbene, triclosan, clofibrate, clofibrate methyl, clofibric acid, 2,4-Dichlorophenol, 2,3,4-Trichlorophenol, 4-Chlorophenol) by adsorption on the synthetic resin Sepabeads SP207. Biologically treated municipal wastewater (secondary effluent) was the aquatic medium.

The following results were obtained from this work:
The removal rates of the selected EDCs were higher than 90% except for carbamazine, Bisphenol A, norethindrone and ethinylestradiol (80%) (Fig. 1).

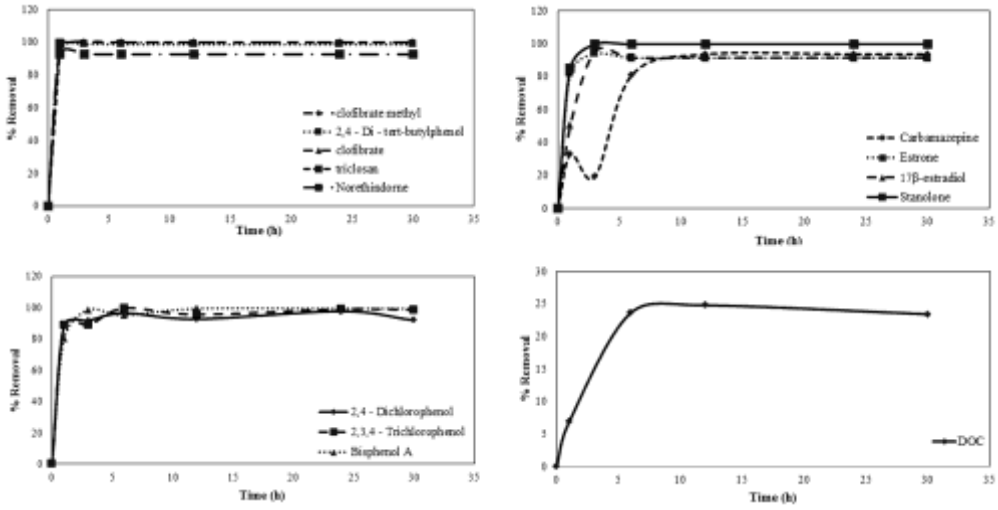

Figure 1. Removal of selected EDCs (a-c) and DOC (d) as a function of time

Regeneration of the SP207 resin with either HCl acid or NaOH solutions were possible with very little loss in the resin's capacity even after four cycles of regeneration-adsorption (Fig. 2). The regeneration solvents had almost equal capacity in regenerating the resin with the NaOH solution being only slightly better than HCl acid for some of the compounds during the fourth regeneration-adsorption cycle.

The removal of DOC followed a different pattern: During the application of the virgin resin, 33% of the DOC was removed. However, when regeneration took place, removal of DOC increased to 43-50% after the first regeneration (indicating some type of resin activation) and then dropped to between 25 and 30%.

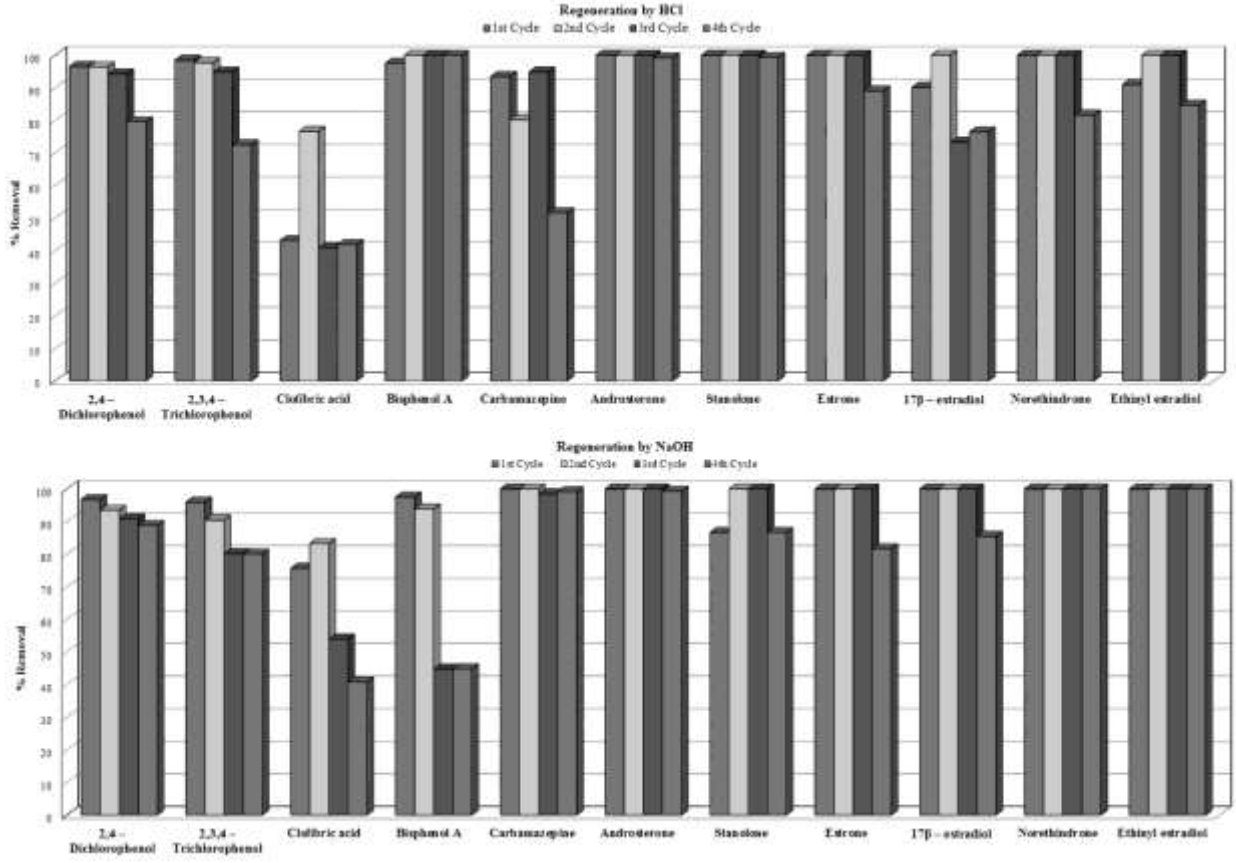

Figure 2. Effect of regeneration-adsorption cycle on the removal of selected EDCs. Regeneration of resin SP207 by HCl 2M and NaOH 1M

The results indicated that the removal of EDCs by adsorption on polymeric resins is an effective method. Very high removal rates were obtained (often exceeding 90%), while the adsorption of effluent organic matter is not competitive to the adsorption of EDCs. Regeneration of the resin by acid or base solution is simple and effective, and it can easily be adjusted for full-scale in-situ application. The ease of in-situ regeneration and the high efficiency of the regenerated resin make the use of synthetic resins a good alternative to activated carbon for advanced treatment of secondary effluents.

REFERENCES

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