

## Structural modifications induced by adsorption of pharmaceuticals from water on Y organophilic zeolite

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Domestic and commercial wastewaters contain a variety of organic wastewater contaminants such as pharmaceuticals and personal care products. These compounds undergo incomplete removal in wastewater treatment plants and they are found in the surface waters receiving the effluents of these plants. In the present work the removal of several drugs (which differ in chemical properties and molecular dimensions) from water by Y organophilic zeolite ( $\text{SiO}_2/\text{Al}_2\text{O}_3$  ratio equal to 200) was investigated. All selected drugs (erythromycine, carbamazepine, levofloxacin, hydrochlorothiazide, ketoprofene, diclofenac) are ubiquitous contaminants in the sewage waters, nor effectively removed by conventional activated sludge treatment and membrane bioreactors (MBRs). This study has a dual purpose: i) to measure the sorption capacity of hydrophobic commercial zeolite material weighed against drugs dissolved in water and to quantify aspects of their removal efficiency for potential use in wastewater and ground-water remediation, and ii) to understand the zeolite structure features for adsorption of drugs in aqueous solutions. Kinetics and adsorption isotherm batch data were obtained via HPLC-DAD. Breakthrough curves were obtained by using 0.2x2 cm SS column and a standard HPLC equipment. Powder diffraction patterns were measured on a Bruker D8 Advance Diffractometer equipped with Sol-X detector. Thermogravimetric (TG) and differential thermal analyses (DTA) measurements were performed in air up to 900°C using a STA 409 PC LUX<sup>®</sup> - Netzsch at 10°C/min heating. After adsorption, the X-ray diffraction patterns of untreated and exhausted samples show relevant differences both in the intensity and position of the diffraction peaks, indicating that the zeolite crystal structure was markedly modified by the pharmaceuticals adsorption experiment. Rietveld refinement demonstrated that the adsorption of the tested pharmaceuticals in Y zeolite induces strong unit cell parameter variations as well as remarkable distortion of the framework, thus confirming the adsorption of the drugs inside the channel system. The results of this study indicate that Y zeolite is an efficient materials for the removal of selected contaminants in wastewater remediation rate.