A study on the kinetics of olive mill wastewater (OMWW) polyphenols adsorption on the commercial XAD4 macroporous resin

Konstantinos B. Petrotos*, Paschalis E. Gkoutsidis, Maria I. Kokkora, Konstantia G. Giankidou, Andreas G. Tsagkarelis

Department of Biosystems Engineering, Laboratory of Food and Environmental Process Engineering, Technological Educational Institute of Larissa, TEI Campus, Larissa 41100, Greece

Tel. +30 2410 684524; Fax: +30 2410 613158; email: petrotos@teilar.gr

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ABSTRACT

The commercially available macroporous resin XAD4 was evaluated for its capacity to adsorb the polyphenols contained in olive mill wastewater (OMWW). The adsorption was performed in the mode of fixed packed bed contactor. The effects of OMWW flow rate, temperature, dilution and pH on the resin adsorption capacity were investigated. Polyphenols concentration decreased with time. The pattern of the total polyphenols concentration dependence on time was found similar in all cases. The pattern included a very steep section for roughly the first 2 h of the operation, followed by a second section of decreasing gradient down to a final asymptotic equilibrium limit. Neither the time required for approaching the equilibrium nor the magnitude of the equilibrium concentration was substantially affected by the OMWW temperature. The increase of OMWW flow rate affected markedly the speed of approaching the equilibrium but not its position. The variation of the total polyphenols concentration showed that higher concentrations yielded more rapid kinetics at the initial section, but no apparent differentiation of the time was required to approach equilibrium. Acidic pH appeared to be favourable for the adsorption. Finally, a novel modelling approach was developed to simulate the adsorption process kinetics.

Keywords: Olive mill wastewater (OMWW); Dephenolization; Adsorption; Macroporous resins; Mathematical modelling

*Corresponding author.