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Colour and TOC reduction using biofilter packed with natural zeolite for the treatment of textile wastewaters

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ABSTRACT

The main contribution of the presented research is to examine the potential of natural zeolite for colour and TOC reduction when packed in a fixed-bed system, considering various parameters such as wastewater characteristics, properties of natural zeolite, loading rate and hydraulic retention time. Firstly, the diverse chemical aspects of tuff were determined using scanning electron microscopy and infrared spectroscopy with the intention of establishing the impact of tuff surface and chemical composition on its adsorption properties and decolouration possibilities. Secondly, a series of dynamic experiments were conducted on laboratory-prepared wastewaters combining chemically differ reactive dyestuffs, auxiliaries and chemicals in order to investigate biofilter's treatment efficiency. Assessment of the biofilter's performance was verified by monitoring absorbance and total organic carbon in initial and treated wastewaters. The results showed that when increasing the load from 22 to 37 mg/m^{3}d (dyes) and from 84 to 154 mg/m^{3}d (organic), colour removal efficiency decreased from 57 to 20% (RB5), from 80 to 46% (RB19) and from 72 to 55% (RR22), and TOC removal efficiency from 75 to 31%. And, when increasing the hydraulic retention time from 11 up to 17 h, the decolouration increased from 20 to 57% (RB5), from 46 to 80% (RB19) and from 16 to 57% (RR22), and TOC removal efficiency from 30 to 75%.

Keywords: Biofilter; Zeolitic tuff; Synthetic textile wastewaters; Colour reduction; TOC reduction

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