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ADSORPTION OF SIMAZINE AND BOSCALID ONTO ACID-ACTIVATED NATURAL CLINOPTILOLITE

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Abstract

It has been recently shown that acid activation enhances the ability of zeolitic tuffs to bind weak organic bases. More specifically, tuff containing acid-resistant zeolites (i.e. clinoptilolite) exhibits higher sorption capacity than chabazite/phillipsite-rich tuff.
Based on the above considerations, we investigated in depth the adsorption behaviour of two pesticides onto acid-activated clinoptilolitic tuff under different experimental conditions. The pesticides simazine and boscalid were chosen based on their different physico-chemical properties, simazine being a very weak organic base (pK_a=1.6) of low hydrophobicity (K_{OW} = 126) whereas boscalid is uncharged in the pH range 2-10 (pK_a=12.1) and has a moderate hydrophobic character (K_{OW} = 912). The acid-activated clinoptilolitic tuff adsorbent was obtained by treating a fixed amount of raw tuff with 0.1M HCl solution for two days.
The results of the experiments indicate that sorption is fast for both pesticides, reaching the equilibrium within hours. The acid treatment significantly improved the sorption capacity of the clinoptilolitic tuff for simazine, increasing the saturation level by over 70 times. In contrast, the sorption of boscalid was barely affected by the treatment. pH, cation exchange type and ionic strength appeared to play a relevant role in the sorption process, whereas the temperature and the specific surface area had no significant influence. Fast kinetics and good sorption capacity suggest that clinoptilolitic tuff, conveniently treated with acids, could be a suitable adsorbent for simazine and similar compounds.

Key words: acid activation, adsorption, boscalid, clinoptilolite, simazine

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