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Development of a predictive model to determine micropollutant removal using granular activated carbon

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Abstract. The occurrence of organic micropollutants in drinking water and its sources has opened up a field of study related to monitoring concentration levels in water sources, evaluating their toxicity and estimating their removal in drinking water treatment processes. Because a large number of organic micropollutants is currently present (although in relatively low concentrations) in drinking water sources, a method should be developed to select which micropollutants has to be evaluated with priority. In this paper, a screening model is presented that can predict solute removal by activated carbon, in ultrapure water and in natural water. Solute removal prediction is based on a combination of solute hydrophobicity (expressed as log D, the pH corrected log K_{ow}), solute charge and the carbon dose. Solute molecular weight was also considered as model input parameter, but this solute property appeared to relate insufficiently to solute removal.

Removal of negatively charged solutes by preloaded activated carbon was reduced while the removal of positively charged solutes was increased, compared with freshly regenerated activated carbon. Differences in charged solute removal by freshly regenerated activated carbon were small, indicating that charge interactions are an important mechanism in adsorption onto preloaded carbon. The predicted solute removal was within 20 removal-% deviation of experimentally measured values for most solutes.

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