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Authors: Jan Freihardt, Martin Jekel, Aki S. Ruhl

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Comparing test methods for granular activated carbon for organic micropollutant elimination

Jan Freihardt[1,*], Martin Jekel[1], Aki S. Ruhl[1]

[1]Chair of Water Quality Control, Technische Universität Berlin, Sekr. KF4, Straße des 17. Juni 135, 10623 Berlin, Germany

[*]Corresponding author. E-mail: jan.freihardt@posteo.de

Highlights:

- Comparison of test methods for evaluating adsorption capacity of activated carbon
- Potential decrease of particle size in magnetically stirred batch experiments
- Severe pressure losses in small-scale column tests even with tap water
- Constant removal in fixed-bed adsorbers as a potential option for filter operation
- Correlations between fixed-bed adsorbers and batch experiments

1 Abstract

Adsorption onto granular activated carbon (GAC) is an effective treatment step for the removal of organic micropollutants (OMP) from wastewater or drinking water. Different test methods are commonly used for evaluating the capability of a GAC depending on the raw material and activation method. Several of these methods have been tested with one GAC and different size fractions obtained by grinding and sieving: batch experiments with two distinct modes of agitation (magnetic stirring and horizontal agitation), laboratory-scale adsorbers (LSA), rapid small-scale column tests (RSSCT) and differential column batch reactors (DCBR). It was found that magnetically stirred batches and DCBR are well suited for minimizing the effects of film diffusion. However, magnetic stirring reduces the particle size especially for large grains and long experimental periods. For fixed-bed adsorbers (LSA and RSSCT), it was shown that increasing the contact time of the water with the GAC at high throughputs can significantly improve the removal of OMP even after 100,000 bed volumes. However, permeability losses in RSSCT even with tap water have to be considered as a severe drawback.