

Supplementary data for

**Efficient Low-Cost Anaerobic Treatment of
Wastewater Using Biochar and Woodchip Filters**

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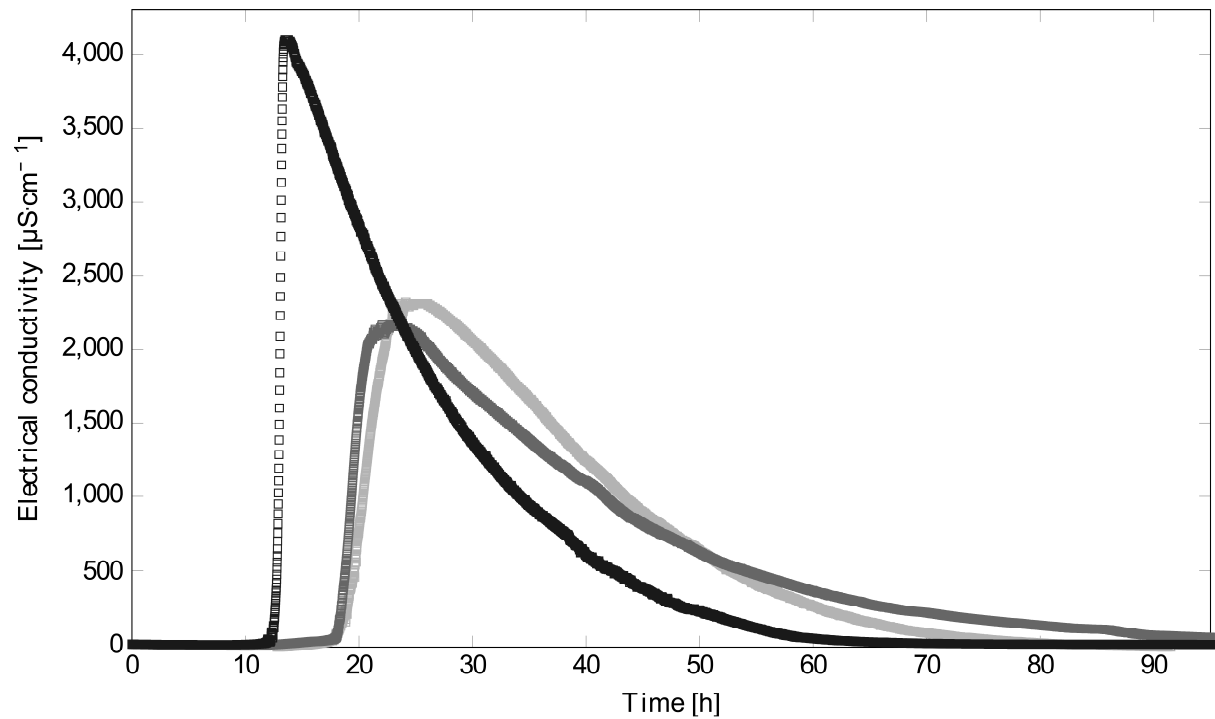


Figure S1. Electrical conductivity over time of effluents from different filter units after adding a pulse of NaCl to influent tap water. Hydraulic loading rate of filters, gravel (black), biochar (grey) and woodchips (light grey) was $0.05 \text{ m} \cdot \text{h}^{-1}$.

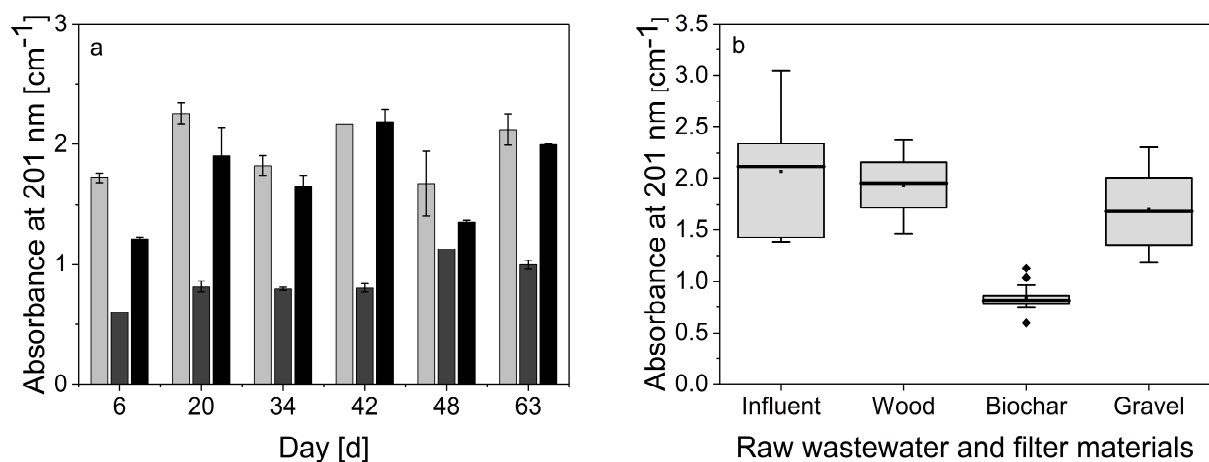


Figure S2. Mean UV-Extinction of filter effluents at 201 nm (a) of gravel (black), biochar (grey) and woodchips (light grey) over time. Error bars represents standard deviation. Boxplot of UV-Absorbance at 201 nm of filter effluent and raw water (b).



Figure S3. Samples of filter influent (right) and effluent of biochar filter (left).

Table S1. Chemical and physical characteristics of biochar and woodchips. Standard deviations are presented as variation range.

Parameter	Unit	Biochar	Woodchips
Specific surface area (BET)	$\text{m}^2\cdot\text{g}^{-1}$	485	<1
Specific surface area (BET)	$\text{m}^2\cdot\text{m}^{-3}$	$1.11\cdot 10^8$	$1.69\cdot 10^5$
Zeta potential	mV	-20.8 ± 0.8	-13.1 ± 1.6
Total carbon (C)	% w·w ⁻¹	89.2	47.1
Total nitrogen (N)	% w·w ⁻¹	1.0	<0.10
Oxygen (O)	% w·w ⁻¹	1.9	37.5
Hydrogen (H)	% w·w ⁻¹	1.6	7.1
Sulfur (S)	% w·w ⁻¹	0.04	0.031
Total phosphorous (P)	$\text{mg}\cdot\text{g}^{-1}$	4.3	1
C/O	-	46.9	1.26
C/N	-	89.2	>471

Table S2. Chemical and physical characteristics of quartz gravel. Specific surface area was calculated according to Wichern et al. (2008)¹. Standard deviations are presented as variation range.

Parameter	Unit	Gravel
Specific surface area	$\text{m}^2\cdot\text{g}^{-1}$	< 0.001
Specific surface area	$\text{m}^2\cdot\text{m}^{-3}$	< $1.55\cdot 10^3$
Zeta potential	mV	$- 28.4 \pm 1.3$
Na ₂ O	% w·w ⁻¹	0.09
MgO	% w·w ⁻¹	0.02
Al ₂ O ₃	% w·w ⁻¹	1,3
SiO ₂	% w·w ⁻¹	97.6
K ₂ O	% w·w ⁻¹	0.87
CaO	% w·w ⁻¹	0.02
TiO ₂	% w·w ⁻¹	0,024
Fe ₂ O ₃	% w·w ⁻¹	0,067
P ₂ O ₅	% w·w ⁻¹	< 0.01

Table S3. Porosity of different filter materials and theoretical hydraulic retention time. Porosity of dried and saturated woodchips and biochar were determined. HRT was calculated from storage reservoir to sampling port.

Material	Porosity of fraction [%]			HRT [h]
	11/16 mm	8/11 mm	5/8 mm	
Gravel	43	41.2	41.4	17.2
Woodchips (dry)	78.8	78.2	81.4	28.5
Woodchips (wet)	52.1	51.6	53.6	20.5
Biochar (dry)	73.4	72.4	73	26.6
Biochar (wet)	47.8	43.3	40.7	17.8

Table S4. Physical parameters of filter influent and effluent. Standard deviations are presented as variation range.

Parameter	Unit	Influent	Woodchip	Biochar	Gravel
pH		7.8 ± 0.2	7.8 ± 0.3	7.8 ± 0.3	8 ± 0.2
EC	μS·cm ⁻¹	1178 ± 166	1177 ± 168	1148 ± 154	1177 ± 171
Temperature	°C	5 ± 1	22 ± 1	22 ± 1	22 ± 1

References:

- 1 M. Wichern, C. Lindenblatt, M. Lübken and H. Horn, *Water Res.*, 2008, **42**, 3899–909.