

Table S1 UKBRC specification sheets containing the detailed properties of the ten standard biochars used in this study [71].

Basic Properties		RH550	OSR550	WSP550	MSP550	SWP550
Moisture	wt% (a.r.)	1.54	2.61	1.88	1.83	1.52
C _{tot}	wt% (d.b.)	48.69	68.85	68.26	75.41	85.52
H	wt% (d.b.)	1.24	1.82	2.10	2.42	2.77
O (by difference)	wt% (d.b.)	2.47	8.91	6.92	9.24	10.36
H:C _{tot}	Molar ratio	0.28	0.32	0.37	0.38	0.39
O:C _{tot}	Molar ratio	0.04	0.10	0.08	0.09	0.09
Total ash	wt% (d.b.)	47.93	19.50	21.25	12.15	1.25
Total N	wt% (d.b.)	1.04	1.59	1.39	0.78	<0.10

Basic Properties		RH700	OSR700	WSP700	MSP700	SWP700
Moisture	wt% (a.r.)	1.49	3.63	2.17	2.23	1.00
C _{tot}	wt% (d.b.)	47.32	67.74	69.04	79.18	90.21
H	wt% (d.b.)	0.63	1.09	1.18	1.26	1.83
O (by difference)	wt% (d.b.)	2.06	7.84	5.30	6.99	6.02
H:C _{tot}	Molar ratio	0.16	0.19	0.20	0.19	0.24
O:C _{tot}	Molar ratio	0.03	0.09	0.06	0.07	0.05
Total ash	wt% (d.b.)	47.93	21.92	23.82	11.55	1.89
Total N	wt% (d.b.)	0.85	1.26	1.32	1.03	0.16



Figure S1 UKBRC standard biochars and their feedstocks [72].

Table S2 PZC values obtained for the ten standard biochars.

Biochar	pH _{PZC}	Biochar	pH _{PZC}
RH550	7.22	RH700	7.64

OSR550	8.74	OSR700	9.35
WSP550	8.71	WSP700	9.69
MSP550	8.68	MSP700	8.70
SWP550	6.57	SWP700	6.78

Table S3 Comparison of pH_{PZC} values of different biochars. * NPB and BPB refer to newspaper biochar and book paper biochar, respectively.

Biochar	Pyrolysis Temp. (°C)	Pyrolysis Time	pH_{PZC}	Ref.
Biochar from wheat straw	550	5 min	7.8	[49]
Biochars from scrap papers				
*BPB600	600	2 h	11.0	
*NPB600	600	2 h	10.8	
*NPB450	450	2 h	10.2	[54]
*BPB450	450	2 h	8.8	
*NPB300	300	2 h	8.3	
*BPB300	300	2 h	6.9	
Biochars from date palm fronds				
Waste				
B-700-4	700	4 h	9.46	[55]
B-800-2	800	2 h	11.38	
Biochar from mango leaves	800	2 h	7.7	[52]
Biochars from peanut shell				
BC300	300	2 h	7.34	[53]
BC500	500	2 h	9.93	
BC700	700	2 h	10.2	

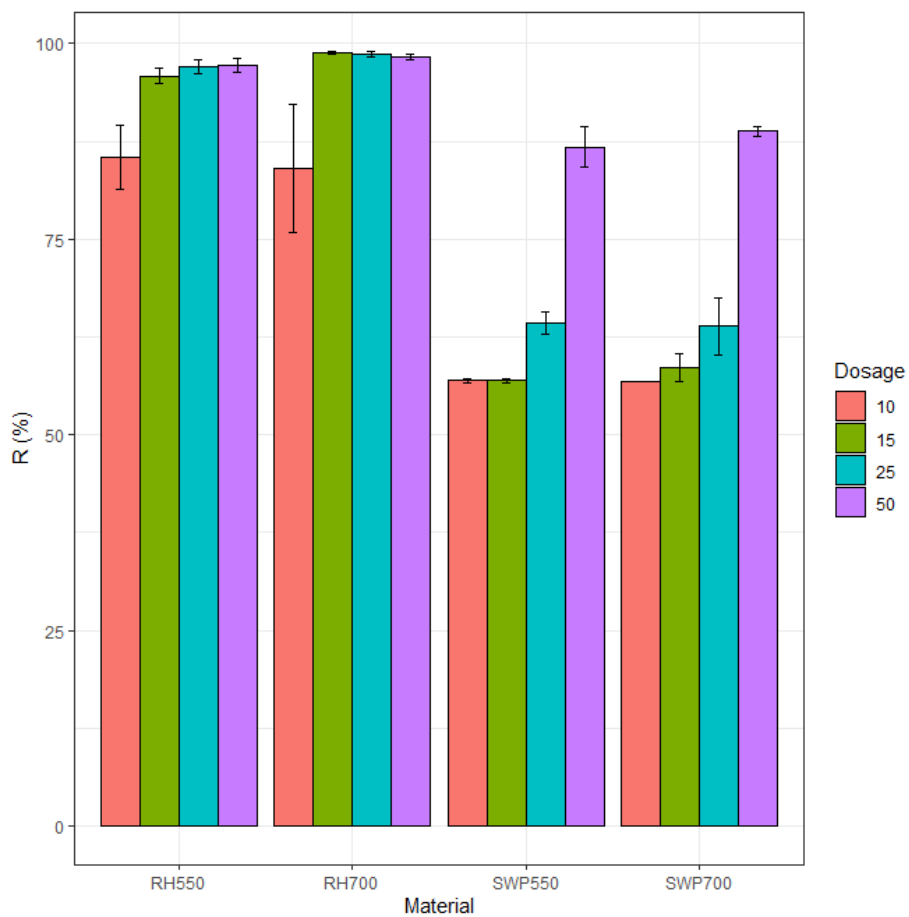


Figure S2 Removal efficiency of MB by biochars combined with the filter over a dosage range of 10-50 g L⁻¹. RH and SWP were prepared at 550 °C and 700 °C. Conditions: MB concentration: 50 mg L⁻¹, contact time: 24 h, temperature: 25 ± 2 °C. Initial pH = 8.

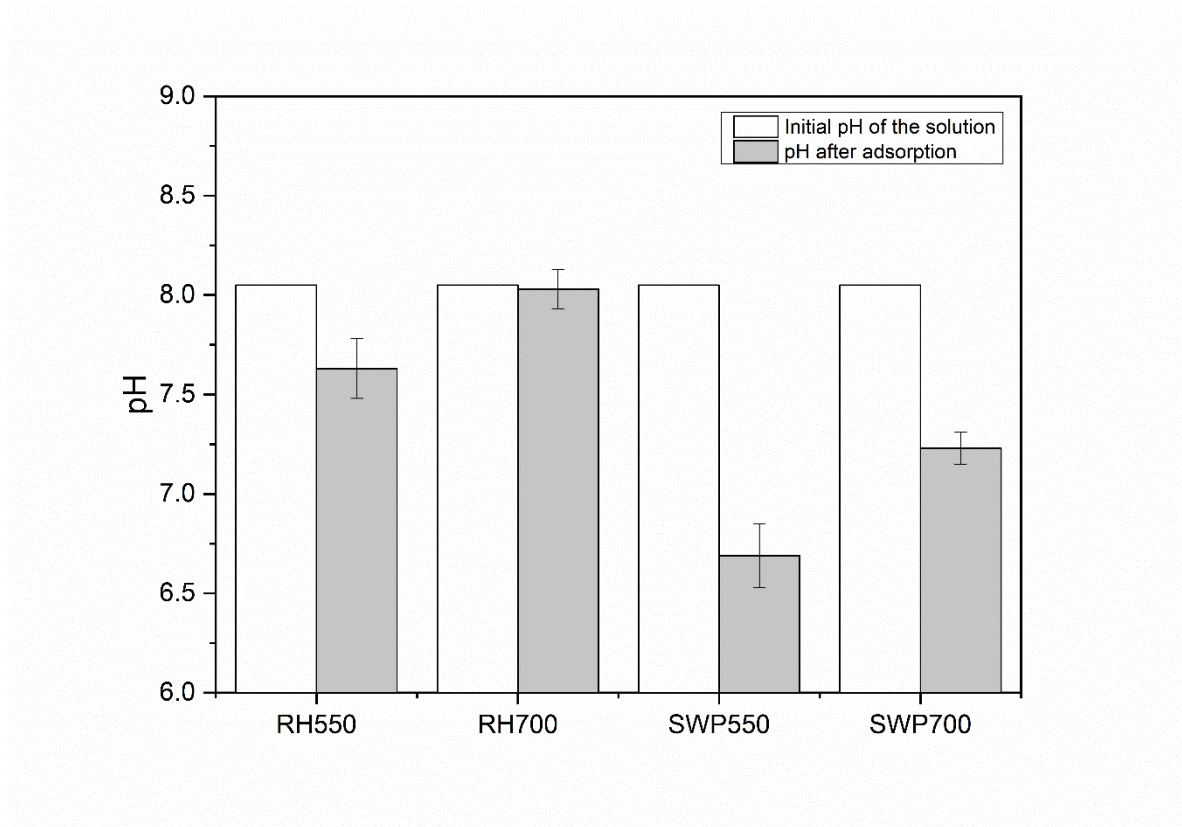


Figure S3 pH after 24h as a result of the mixture between MB and the RH and SWP biochars prepared at 550 °C and 700 °C. Conditions: adsorbent dose: 10 g L⁻¹, MB concentration: 50 mg L⁻¹, contact time: 24 h, 25 ± 2 °C. Initial pH = 8 for all conditions.

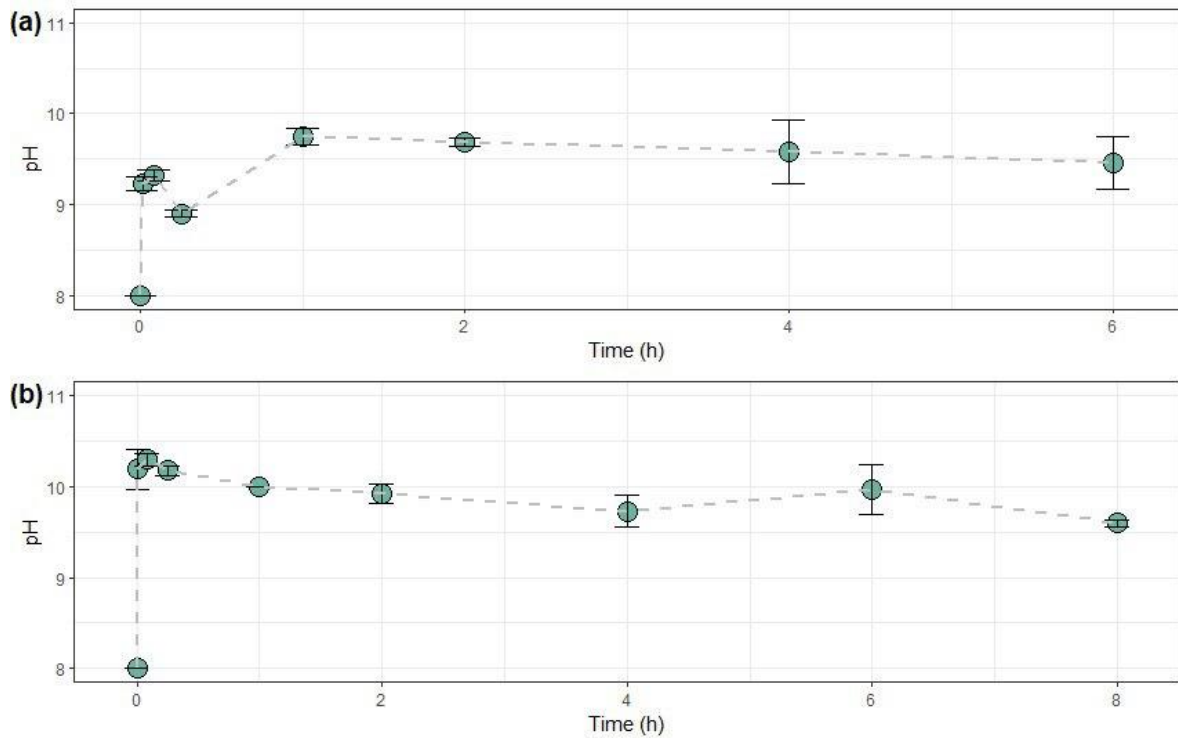


Figure S4 pH values measured at the same time intervals of the kinetic study for MB's adsorption process by RH550 (a) and RH700 (b). Conditions: adsorbent dose: 10 g L⁻¹, MB concentration: 50 mg L⁻¹, contact times: 0, 5, 15, 60, 120, 240, 360, and 480 min, 25 ± 2 °C. Initial pH = 8 for all conditions.