Supplementary information

Article

Evaluation of the adsorption efficiency on the Pb(II) ions removal using alkali-modified hydrochar from *Paulownia* leaves

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Table S1. Kinetic parameters of PFO and PSO non-linear models for Pb(II) adsorption onto MPH-220, C_{Pb}=200 mg/L.

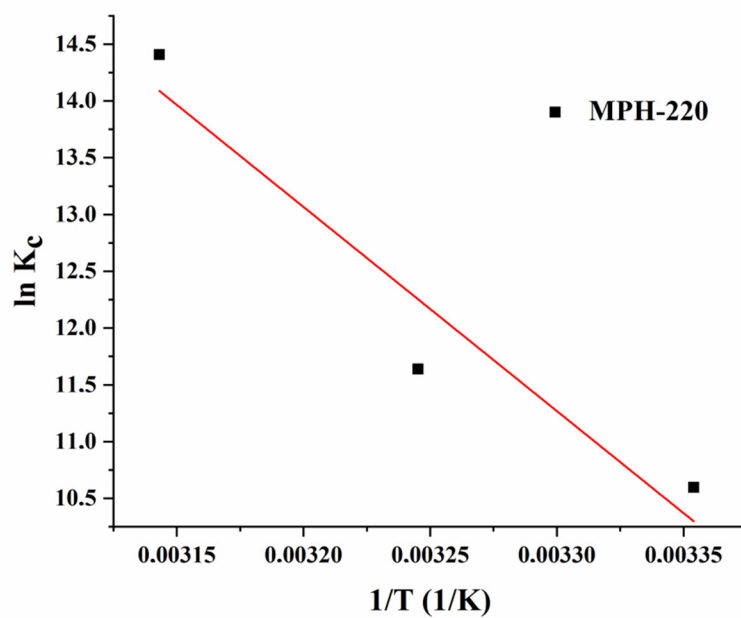| Adsorbent MPH-220	
$q_{eq, exp}$ [mg/g]	110.9
Pseudo-First-Order Model	
$q_{eq,cal}$ [mg/g]	103.6
k_1 [1/min]	0.0072
χ^2	7.08
R^2	0.6638
Pseudo-Second-Order Model	
$q_{eq,cal}$ [mg/g]	109.2
k_2 [g/mg min^{-1}]	0.00012
χ^2	6.29
R^2	0.9137

Figure S1. The adsorption thermodynamic plot of Pb ions removal with MPH-220.

Table S2. The average surface chemical composition (wt%) determined by EDS analysis.

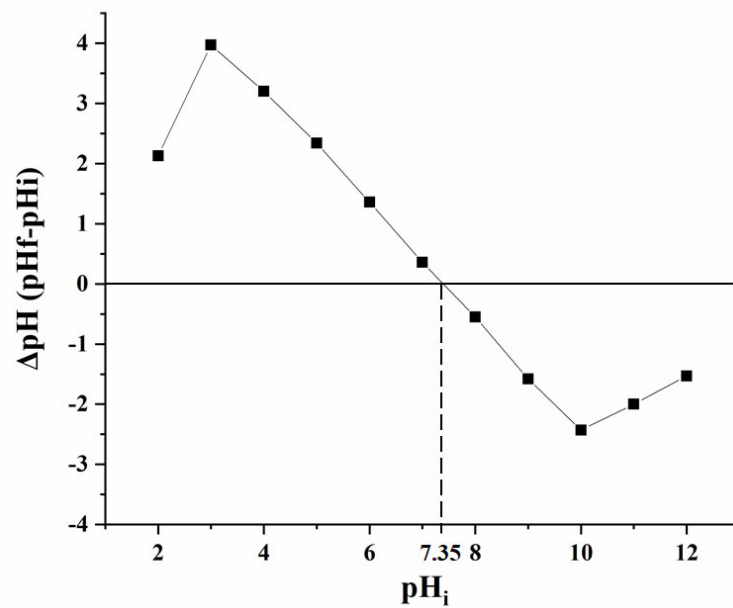| Detected chemical element (%)	PH-220	MPH-220	MPH-220Pb
C	55.88 ± 1.32	54.15 ± 2.43	54.58 ± 2.51
O	39.86 ± 1.56	41.95 ± 1.52	35.87 ± 1.24
Ca	3.43 ± 1.28	2.47 ± 0.85	3.60 ± 1.97
P	0.83 ± 0.11	0.21 ± 0.09	0.94 ± 0.18
Pb	0.00 ± 0.00	0.00 ± 0.00	4.66 ± 0.43

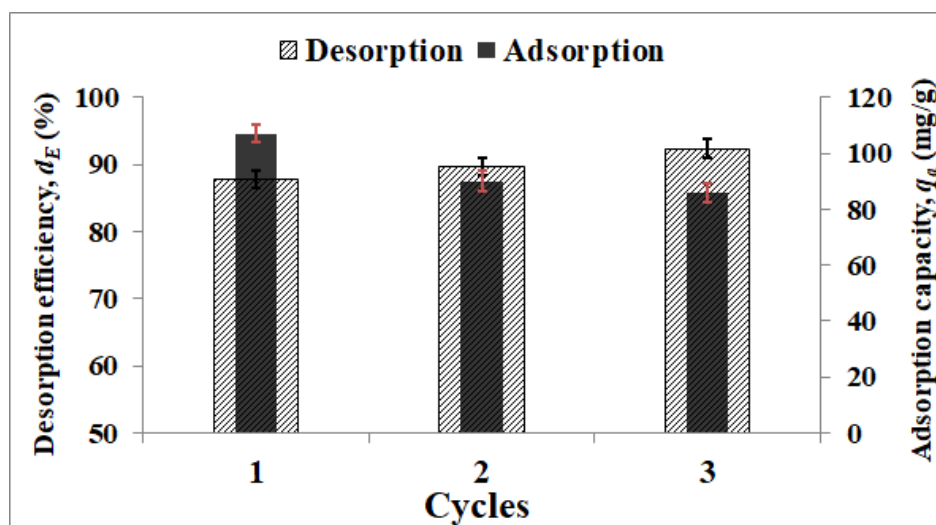**Figure S2.** The point of zero charges (pH_PZC) of the MPH-220 surface

Figure S3. Adsorption and desorption cycle performance of MPH-220.