Electronic Supplementary Material (ESI) for RSC Advances.

Development, modification and application of low cost and available biochar derived from corn straw for the removal of vanadium(V) from aqueous solution and real contaminated groundwater

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Thermo-gravimetric analysis

The TG curves of different absorbents (**Figure 1S**) showed that a continuous weight loss distributed in the range of 38–1000°C. Comparison of the TG curves showed that biochars and AC had higher residual mass (> 70%). Generally, thermal decomposition of biochar could be divided into three stages [31]. In the first stage, loss of surface water occurred at temperatures ranging from 50°C to 100°C. The second stage ranged from 100°C to 350°C, where the degradation of surface functional group occurred. In the last stage, once the temperature was higher than 350°C, the carbon skeletons started to disappear. As the temperature continued to increase from 350°C to 700°C, a smooth and steady weight loss (3.06%-8.08%) of biochars was observed (**Figure 1S**). Biochars and AC followed nearly different degradation patterns in temperatures from 700°C to 1000°C. Zr-BC, Cs-BC, BC and AC showed better thermal stability as compared to Zn-BC. Thus, comparing the residual mass, Zr-BC (89.12%), AC (87.39%), Cs-BC (82.38%) and BC (81.91%) had better protection from thermal degradation than Zn-BC (72.67%).

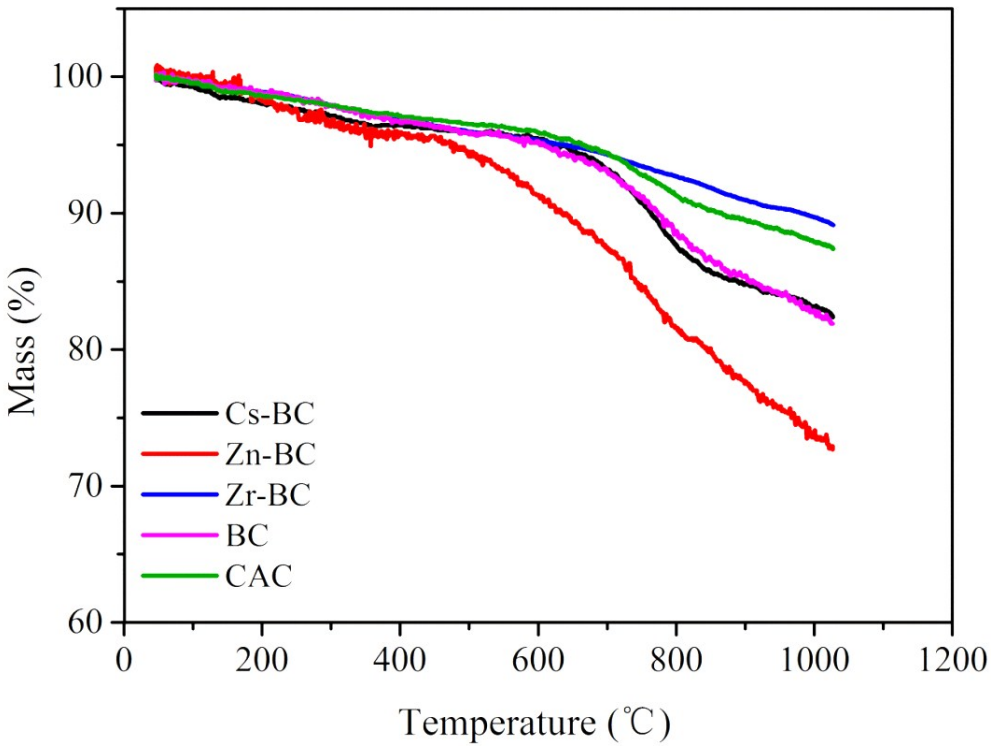

Figure 1S. TG curves of modified biochars, BC and AC.

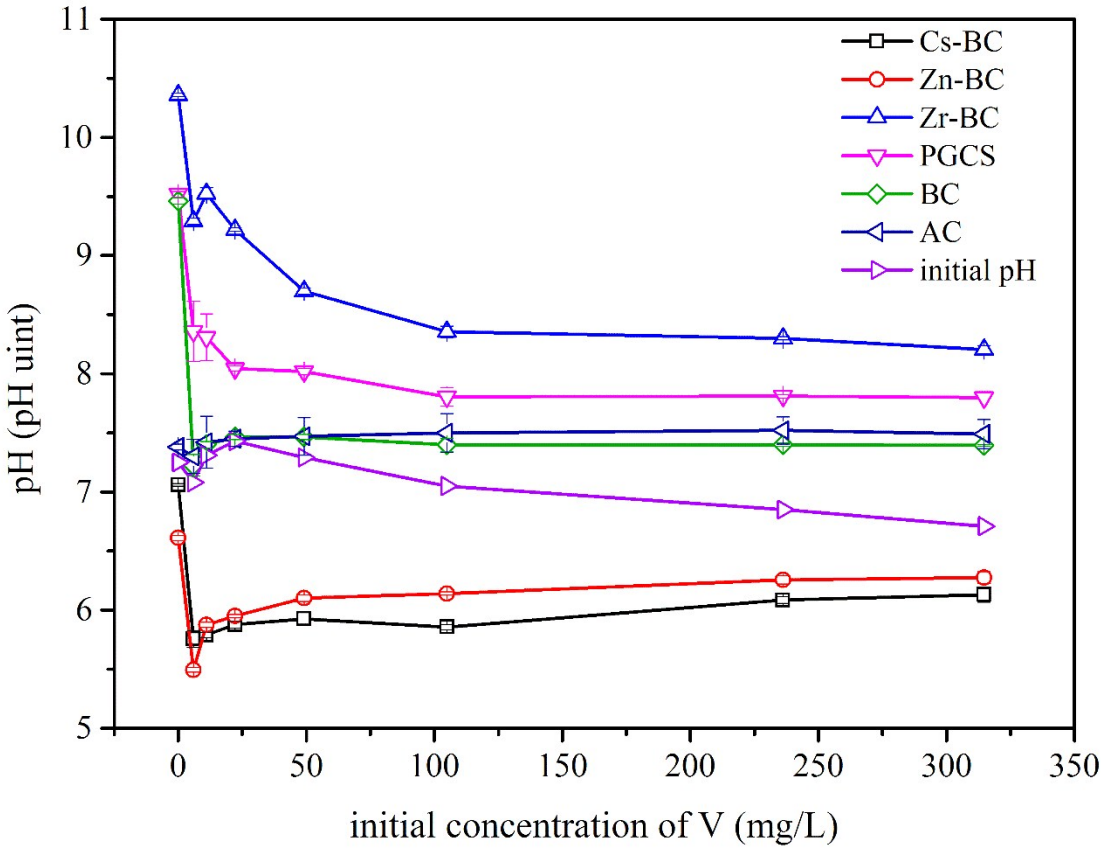

Figure 2S. pH of aqueous solution after vanadium(V) sorption. Equilibrium conditions: adsorbent dosage 1-8 g/L, 25.0 ± 1.0 °C.

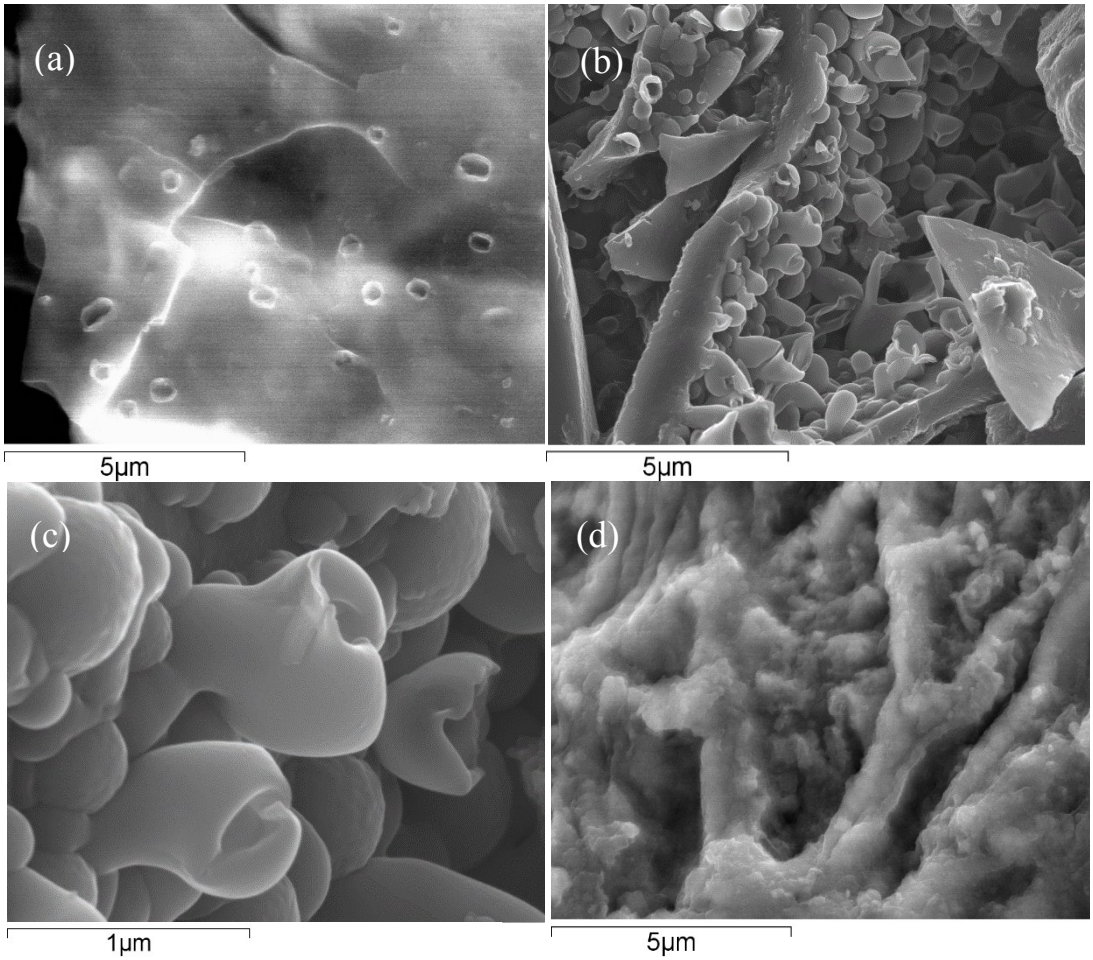

Figure S3. SEM images of the modified biochars: (a) Cs-BC (10000× magnification), (b) Zn-BC (10000× magnification), (c) Zn-BC (50000× magnification), (d) Zr-BC (10000× magnification).

References

[1]. Zhang, M., et al., Synthesis, characterization, and environmental implications of graphene-coated biochar. Science of the Total Environment, 2012. 435-436: p. 567-572.