

## Removal of Pb(II) and Cu(II) from aqueous solutions by ultraviolet irradiation-modified biochar

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### ABSTRACT

We herein report the modification of coconut shell-based biochar by ultraviolet (UV) irradiation to yield a highly efficient adsorbent for Pb(II) and Cu(II). Analysis of the physicochemical properties and structural characteristics of the modified biochar indicated that it contained a greater number of oxygen-containing functional groups on its surface compared with pristine biochar. In addition, the kinetics and adsorption isotherms for the adsorption of heavy metals by the biochar sample were investigated. More specifically, the pseudo-second order equation provided the best correlation for the adsorption process, and the adsorption isotherms fitted well with the Langmuir model. Furthermore, the Langmuir adsorption capacities of the modified biochar towards Pb(II) and Cu(II) were 66.86 and 7.78 mg g<sup>-1</sup>, respectively, which represented 3.57- and 2.39-fold increases compared to the pristine biochar capacities. Moreover, batch sorption experiments demonstrated that the dosage and solution pH affected the removal of these metals from aqueous solutions by biochar. We also found that the adsorption mechanisms of Pb(II) and Cu(II) on modified biochar occurred mainly through surface sorption, likely involving the oxygen-containing functional groups present on the modified surface. Thus, we successfully demonstrated that UV irradiation is a promising modification approach for enhancing the adsorption ability of biochar.

*Keywords:* Biochar; Ultraviolet irradiation; Pb(II); Cu(II); Adsorption

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