**Supporting Information**

**Simultaneous immobilization of lead, cadmium and arsenic in soil by iron-manganese modified biochar**

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**Content**

Fig. S1. Flow chart of the preparation of BC and modified BC.

Fig. S2. The remove rate of different modified biochar for water-soluble As, Cd, and Pb in soil with 5% addition of material as a function of time and material.

Fig. S3. SEM of different MP isolated from the soil after 90 days of reaction.

Fig. S4. XRD of different MP isolated from the soil after 90 days of reaction.

Table S1 Analysis of surface element content.



**Fig. S1.** Flow chart of the preparation of BC and modified BC.



**Fig. S2.** The remove rate of different modified biochar for water-soluble As, Cd, and Pb in soil with 5% addition of material as a function of time and material.



**Fig. S3.** SEM of different MP isolated from the soil after 90 days of reaction.



**Fig. S4.** XRD of different MP isolated from the soil after 90 days of reaction.

**Table S1** Analysis of surface element content

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Soil | MP | Soil | MP | Soil | MP |
|  | Atomic %As 2p | Atomic %As 2p | Atomic %Cd 3d | Atomic %Cd 3d | Atomic %Pb 4f | Atomic %Pb 4f |
| CK | 2.3 | 2.51 | 0.01 | 0.3 | 0.3 | 0.09 |
| BC | 1.94 | 2.94 | 0.01 | 0.33 | 0.38 | 0.15 |
| BC-Fe | 1.82 | 4.78 | 0 | 0.31 | 0.77 | 0.1 |
| BC-Mn | 1.56 | 2.8 | 0.02 | 0.29 | 0.37 | 0.1 |
| BC-Fe-Mn | 1.97 | 4.38 | 0.01 | 0.41 | 0.32 | 0.2 |