Supplementary Information (SI) for Materials Advances.

Eco-inspired synthesis of a melamine formaldehyde-reinforced onion peel biochar/alginate composite for efficient lead ions removal from wastewater

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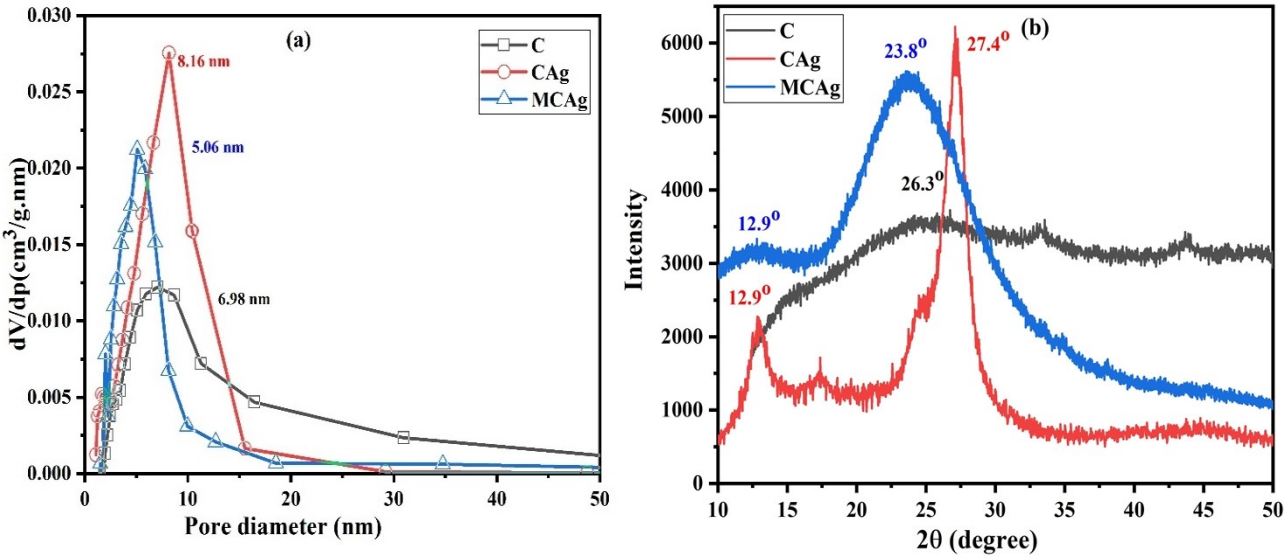


Fig.S1. Barrett-Joyner-Halenda (a) and XRD analysis (b) for C, CAg, and MCAg.

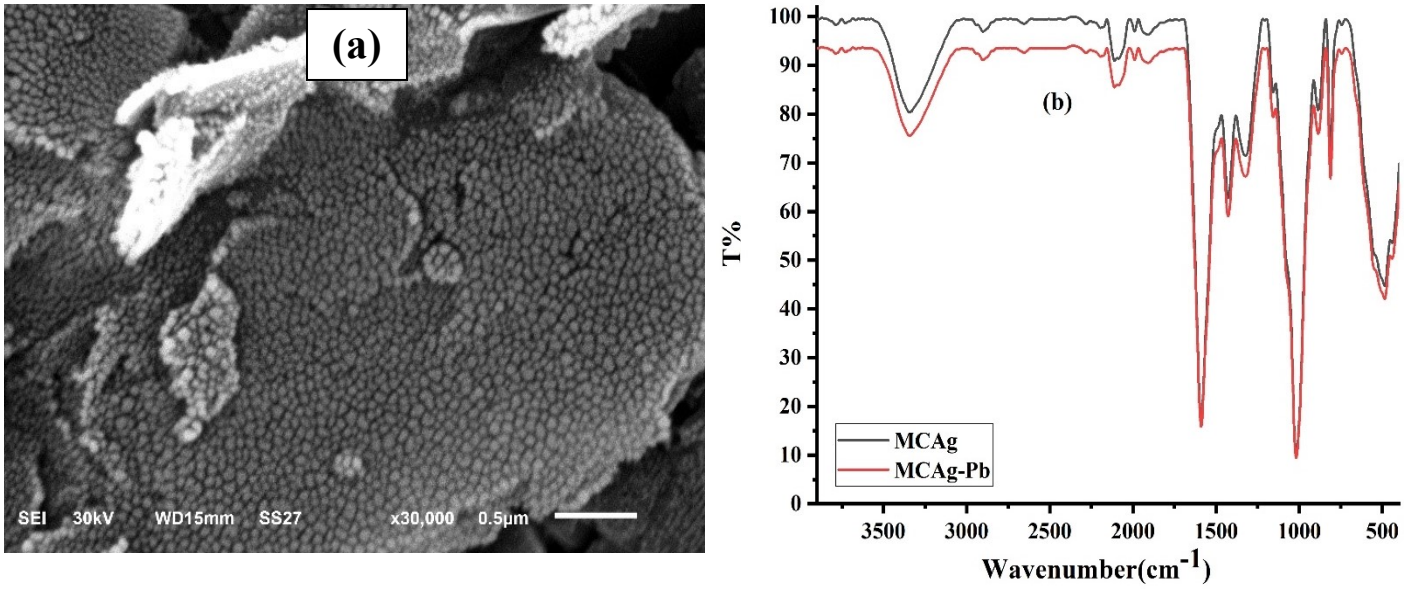
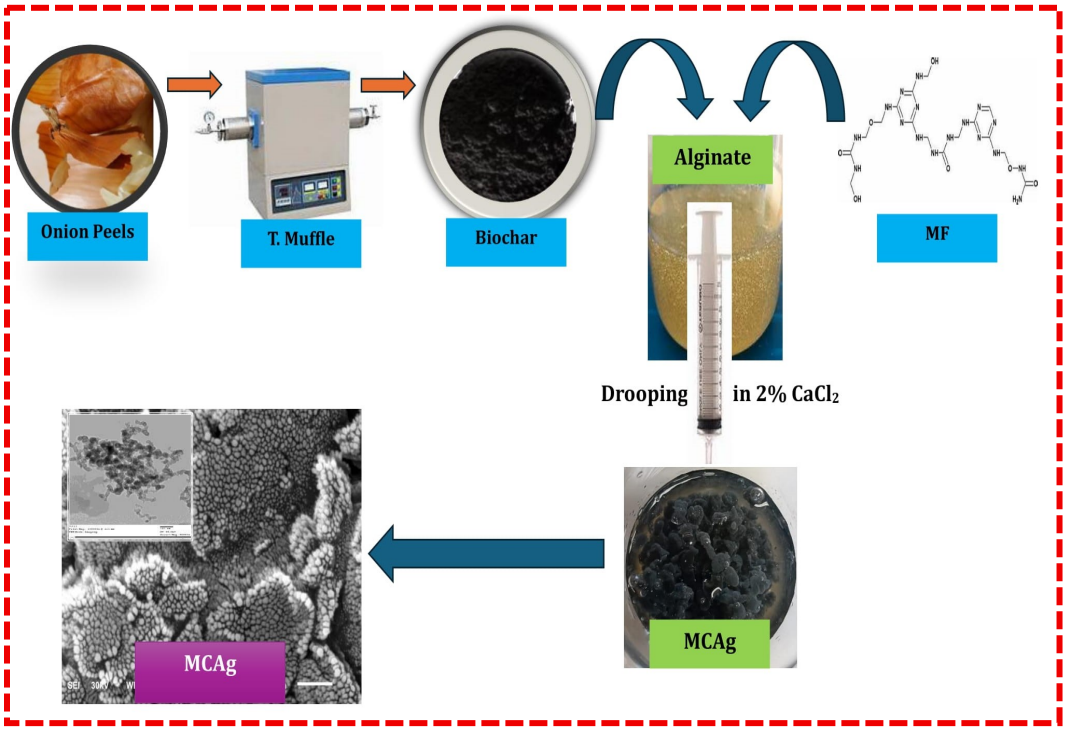


Fig.S2: SEM image(a) and ATR-FTIR (b) of CAg after ten cycles of reusability.



Scheme S1. Schematic representation of the synthesis process for the melamine-formaldehyde/biochar/alginate composite (MCAg).

S1: Chemical composition of the simulated wastewater system

The wastewater produced within an inorganic chemistry research laboratory is often a mixture of inorganic and organic species as a result of ordinary analytical and synthesis activities. Common inorganic cations include Na^{+}, K^{+}, Ca^{2+}, Mg^{2+}, and NH_4^{+}, along with numerous transition-metal ions such as Fe^{2+}/Fe^{3+}, Cu^{2+}, Zn^{2+}, Pb^{2+}, Cd^{2+}, Mn^{2+}, Ni^{2+}, and Co^{2+} emerging from metal salt solutions, redox reactions, and precipitation experiments. Typical anions found in acid-base waste streams include Cl^{-}, NO_3^{-}, SO_4^{2-}, PO_4^{3-}, CO_3^{2-}/HCO_3^{-}, and residual OH^{-}. Such effluent is mostly inorganic, but it can also contain organic components such as ethanol, methanol, acetone, EDTA, organic acids (acetic, oxalic, and citric), amino ligands, and trace surfactants from reagent use, cleaning, or complexation investigations.

Unreacted acids and bases, metal hydroxide or carbonate precipitates, and suspended particles are also frequently found. Due to competition between coexisting ions, the formation of strong metal–ligand complexes, changes in ionic strength, and pH fluctuations that collectively affect metal speciation and adsorbent surface charge, this complex ionic matrix can produce significant interference effects during adsorption processes.