112材料工程系大學部實習成果觀摩競賽

Enhanced Immobilization of EDTA on Graphene Oxide Sponge by Siloxane Bridge for Heavy Metal Removal in Wastewater

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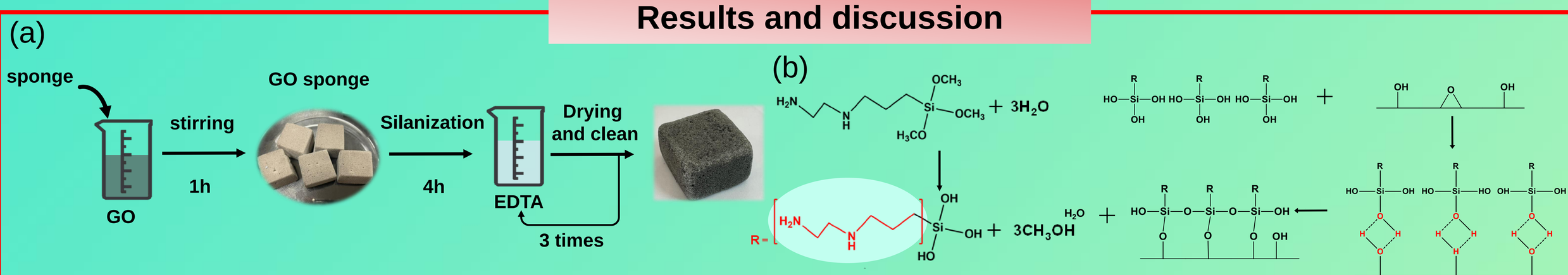
Abstract

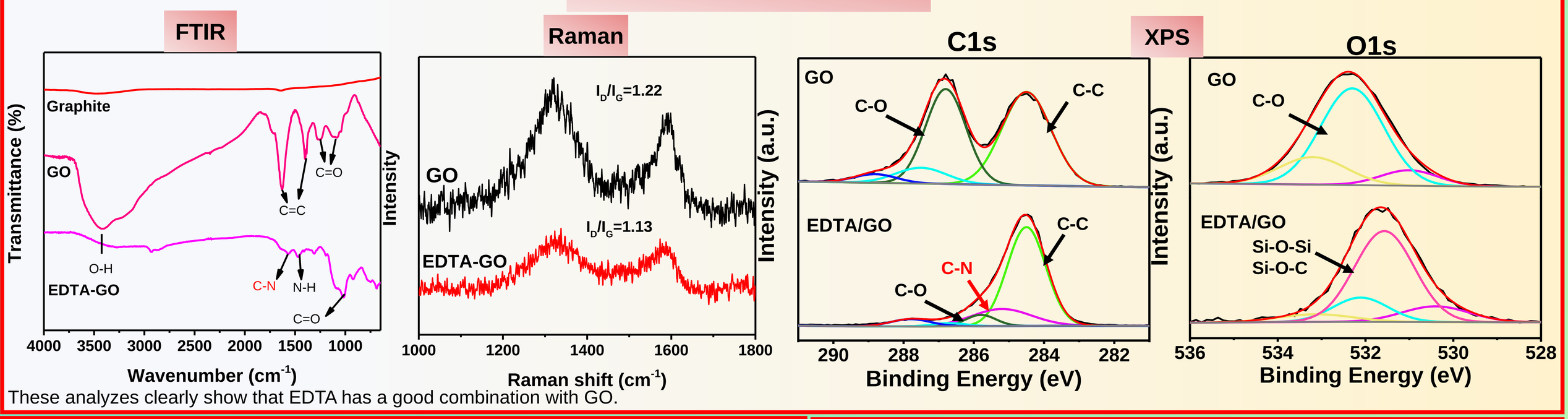
Instead of the traditional practice of adsorbing heavy metal by stirring or precipitation method, herein, we design a flow channel equipped with a 3D functional sponge by grafting ethylenediamine triacetic acid (EDTA) on the graphene oxide-coated sponge surface. In this proposed process, the silanols on EDTA can interact with hydroxyl groups on the graphene oxide (GO) surface by hydrogen bonding. After the drying process, water is removed, and the silanol molecules can anchor EDTA on the GO surface and form a siloxane bridge, which can immobilize EDTA on the GO surface. The metal ions can be adsorbed by an EDTA-functioned sponge through the chelation reaction, providing a promising route for the separation of heavy metal ions from wastewater.

Results and discussion

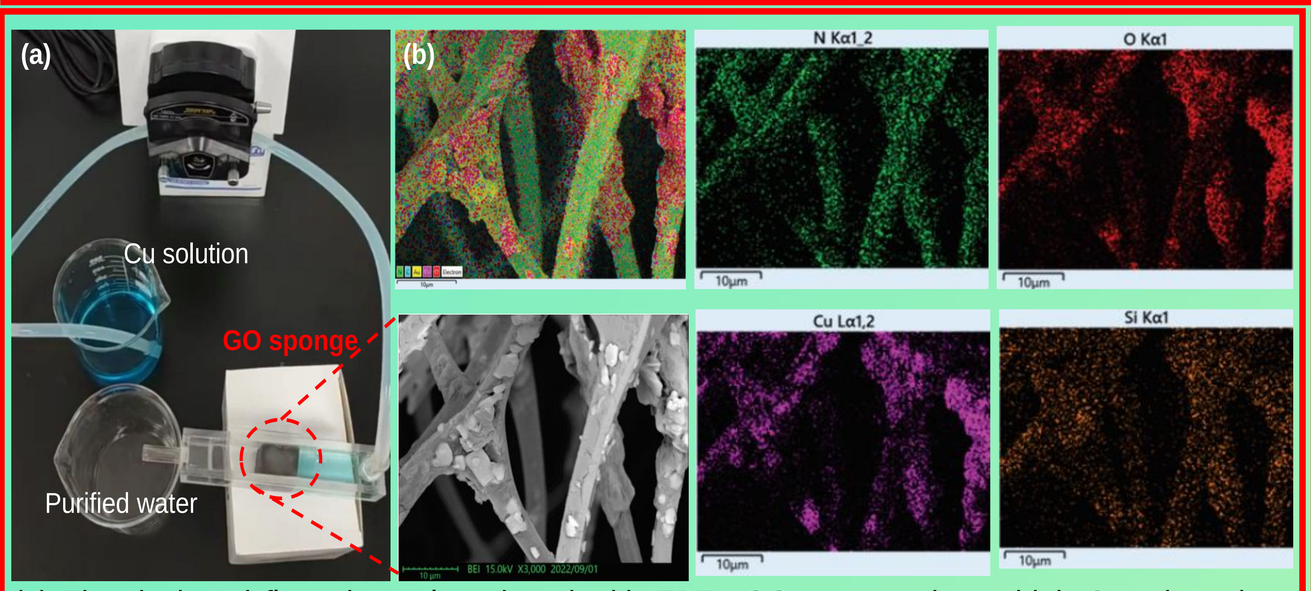


Schematic illustration of the preparation of (a) EDTA/GO/Sponge film and (b) Schematic diagram of the reaction of GO with EDTA-silane.

Characterization

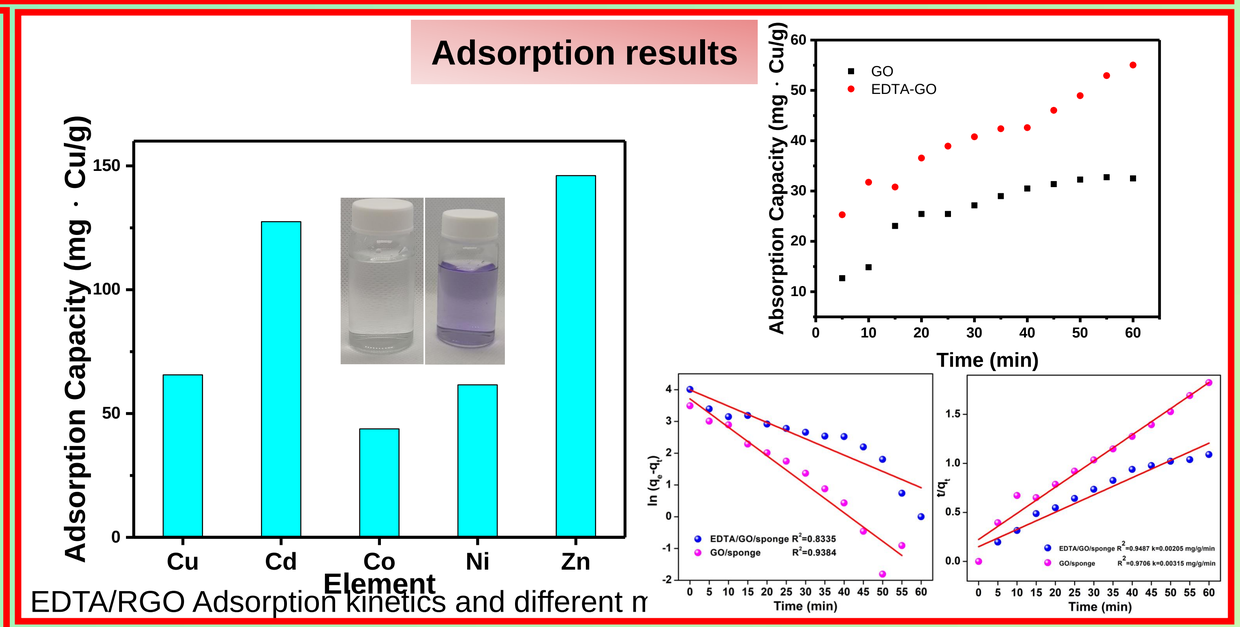


These analyzes clearly show that EDTA has a good combination with GO.



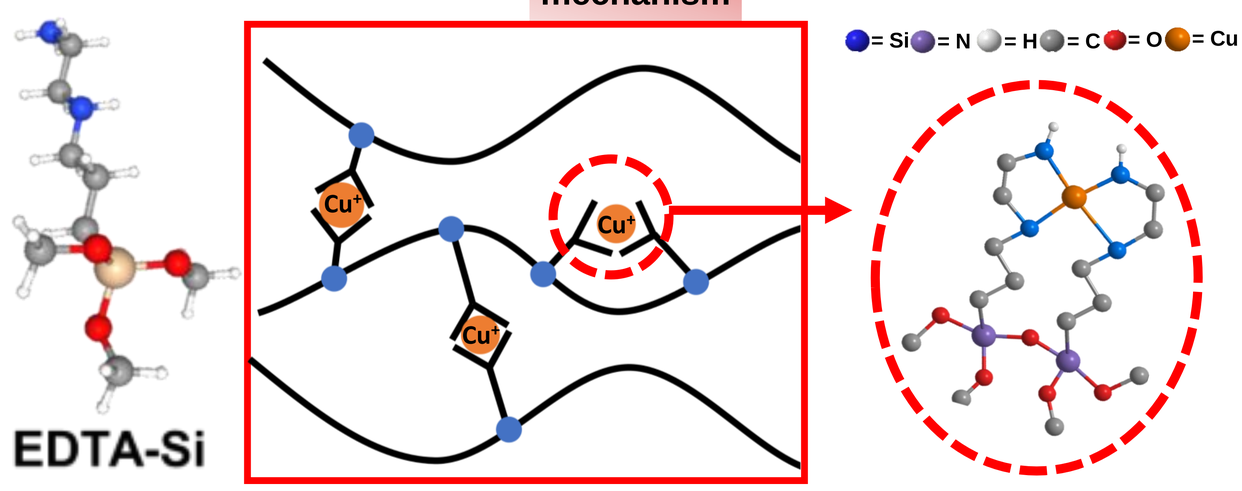
(a) The designed flow channel equipped with EDTA-GO sponge shows high Cu adsorption capacity. (b) The SEM and EDS mapping images of EDTA-GO sponge after Cu adsorption. (c) The picture shows that without siloxane bridge, the EDTA is unable to adhere to the GO surface and releases into the solution.

Adsorption results

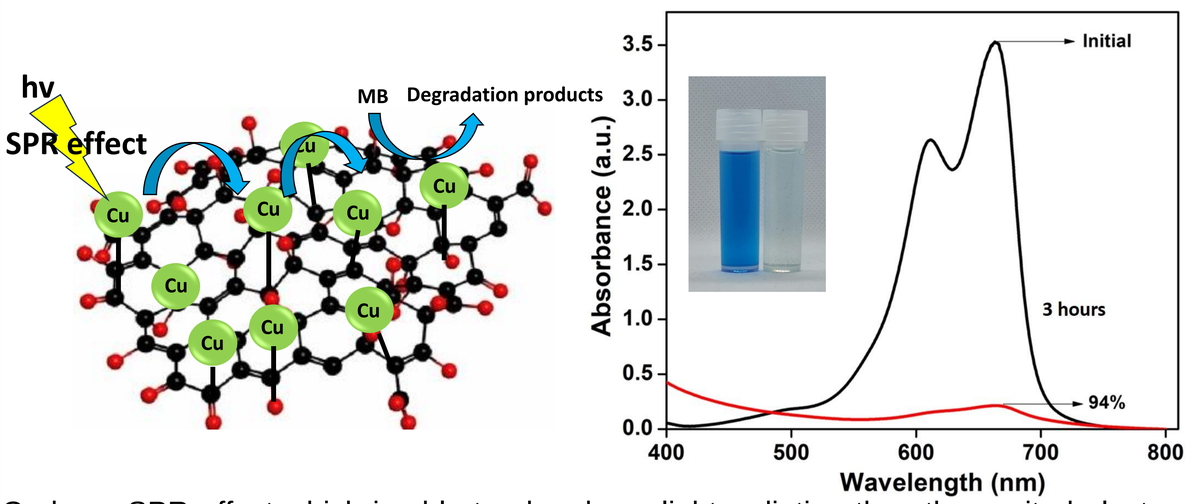


EDTA/RGO Adsorption kinetics and different n

mechanism



Photodegradation Organic Pollutants



Cu have SPR effect which is able to absorb sunlight radiation then the excited electron transfer to GO via EDTA that electron react with the atmospheric oxygen to generate super oxide anion radicals (O_2) that radical attack the MB dye molecules and converted into CO_2 and H_2O

Conclusions

1. EDTA and GO are strengthened and solidified on sponges through silicon bridges to remove heavy metals from wastewater.
2. After reducing EDTA/GO to EDTA/RGO, its adsorption effect has not declined, and it has better conductivity, allowing it to be used in electroadsorption in the future.

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