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**A novel approach to developing a reusable marine macro-algae
adsorbent with chitosan and ferric oxide for simultaneous efficient
heavy metal removal and easy magnetic separation**

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Abstract

Chitosan modified magnetic kelp biochar (Chi-KB_m) was successfully synthesized for efficient removal of heavy metals (Cu²⁺) from wastewater. Interestingly, the characterizations results indicated that Chi-KB_m showed 6 times higher surface area (6.17 m²/g) than the pristine magnetic kelp biochar KB_m (0.97 m²/g). In addition, new functional groups, such as NH and C-N group, have been created on the surface of biochar as a result of chitosan modification process, which in turns led to improve the Cu²⁺ adsorption capacity. The effect of pH and chitosan loading on heavy metal adsorption, and competition reaction of different metal ions adsorption were also investigated. Chi-KB_m exhibited a separation efficiency of more than 99.8%, which allows to recovery and reusability of the adsorbent material and heavy metals

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