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# Adsorption capacity of Chromium [Cr (VI)] on hydroxyapatite coated with graphene oxide or reduced graphene oxide by dip-coating

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## Introduction

Hydroxyapatite (HAP) has attracted considerable attention as a promising adsorbent for heavy metal removal due to its high surface reactivity, ion-exchange capacity, and biocompatibility. More recently, hydroxyapatite/graphene composites have been investigated as filter materials for the removal of heavy metals from contaminated water because graphene oxide (GO) and reduced graphene oxide (rGO) provide high specific surface area and additional adsorption sites.

## Objective

To investigate the adsorption capacity of hexavalent chromium [Cr(VI)] from aqueous solution using hydroxyapatite coated with GO or rGO by the dip-coating technique.

## Methodology

Nano-hydroxyapatite powder was synthesized by wet chemical precipitation and processed into two different geometries:

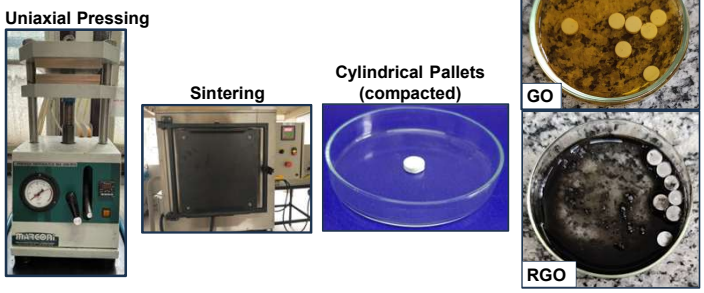



Fig 1: Cylindrical pallets samples processing.

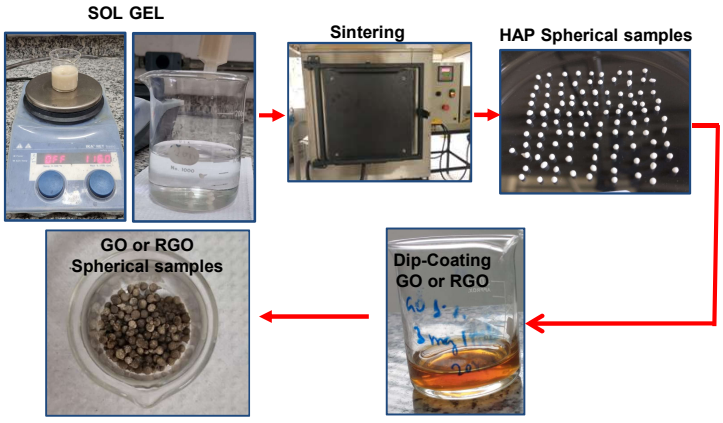



Fig 2:Spherical samples processing.

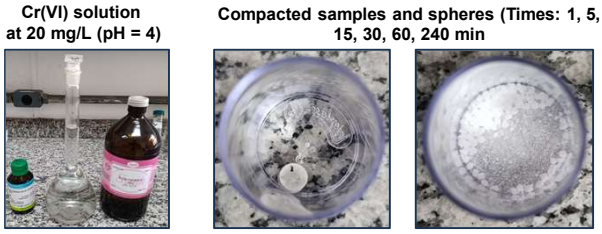



Fig 3: Chromium adsorption assay.

## Discussion and Results

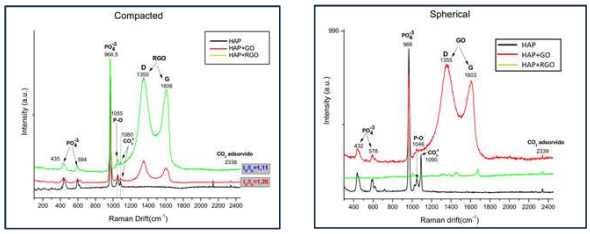



Fig 4: Ramam spectra showing successful GO /RGO coating.

In the spectra of the compacted and spherical samples following dip coating, it is possible to observe the D and G bands of graphene oxide (GO) and reduced graphene oxide (RGO), the $PO4^{3-}$ functional group corresponding to HAp, and $CO_2$ adsorbed from the atmosphere. In the pure HAp samples, the D and G bands are absent

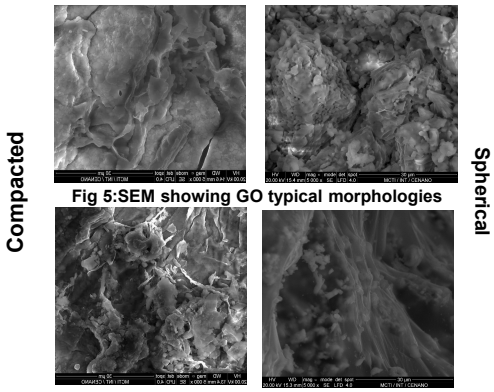



Fig 5:SEM showing GO typical morphologies

Fig 6: SEM showing RGO typical morphologies.

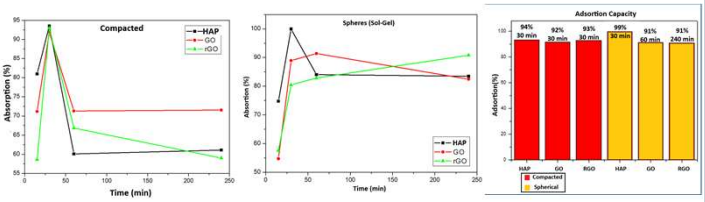



Fig 7: Adortion test results.

ICP-OES results showed that all samples achieved Cr(VI) removal efficiencies above 90% within the first 30 min of immersion. Among all groups, spherical pure HAP exhibited the highest adsorption efficiency, reaching approximately 99%, whereas GO- and rGO-coated samples showed no significant improvement over uncoated HAP under the investigated conditions. After 30 min, the adsorption efficiency decreased markedly, indicating saturation of the adsorption sites.

## Conclusions

These findings demonstrate that sample geometry plays a more decisive role than graphene-based surface modification in the adsorption performance of HAp under the investigated conditions, with spherical HAP exhibiting the most favourable behaviour for Cr(VI) removal from aqueous media.

## Acknowledgements

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