XXI Brazilian Meeting on Inorganic Chemistry
X Brazilian Meeting on Rare Earths
III Workshop on Theoretical Bioinorganic Chemistry
Belo Horizonte, September 12 - 15th 2024

Organofunctionalized bentonite magnetic nanocomposite for efficient removal of rare earth ions from aqueous solutions

Yasmine Macedo Passos[1], Olena Artiushenko[2], and Volodymyr Zaitsev[2]

[1] *Departamento de Engenharia Quimica, Pontifical Catholic University of Rio de Janeiro, Rio de Janeiro, Brazil*

[2] *Departamento de Quimica, Pontifical Catholic University of Rio de Janeiro, Rio de Janeiro, Brazil*

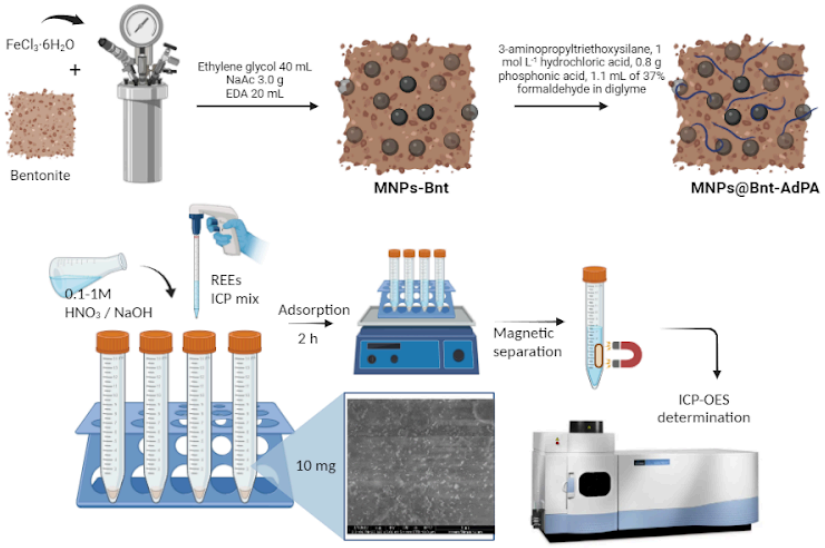
E-mail: vnzaitsev@puc-rio.br

Thematic Area: Materials Chemistry and Catalysis

Keywords: nanocomposite, bentonite, rare earth

Rare earth elements (REEs) have been declared critical mineral raw materials since 2010. Traditionally used in metallurgy, petroleum, and textiles industries, REEs have become crucial components in emerging technologies like clean energy, superconductor materials, modern optics, electronics, IT and communications, nuclear power, and medicine. In 2022, the world's total consumption of rare earths was 164 Ktonnes of total rare earth oxide, and it is predicted to increase five times by 2040. Today, the primary source of REEs is through ore treatment. However, it is estimated that the demand for REEs will exceed the world's mining production in a few years. One of the crucial concepts of industrial strategy to reduce supply risks related to critical raw materials is to increase their recycling. Adsorption technology of REE recycling and separation is an essential step ahead in this direction. Adsorption is more environmentally friendly and cost-effective than solvent extraction; it offers a high enrichment factor, rapid phase separation, and the possibility of combination with different detection techniques.

In this study, we are combining the advantages of inorganic adsorbents, such as high selectivity and adsorption kinetics, with the benefits of bio-adsorbents that have high capacity. We are fabricating advanced magnetic nanocomposites using MNPs-Bnt bentonite with anchored groups of aminodiphosphonic acid (AdPA). The particularities of the synthesis of MNPs-Bnt nanocomposites and their characterizations by various physicochemical methods will be presented together with preliminary studies of the REE recovery methodology.



Acknowledgments: FAPERJ, CNPq, CAPES.