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Development of New Composite Adsorbents (Orange Peel Powder/Sodium Alginate) Raw and Treated With Gamma Ionizing Radiation For Solid-Liquid Separation: Study Test of Adsorption Kinetics of Spyramicin

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ABSTRACT

In the present study, new composite materials were developed in the form of beads based on polymer (sodium alginate) and agro-food waste (orange peel powder) raw and modified by gamma ionizing radiation. This approach aims to increase the chemical bonds capable of trapping pollutants from industrial effluents. The results showed that the synthesized composite materials adsorb spyramicin and the irradiation of orange peel powder before the design of the adsorbent materials improves the retention rate and more particularity when they are irradiated in water.

Keywords:. Synthesis, composite materials, adsorption, spyramicin.

1. Introduction

Water pollution is currently a major concern from both a health and environmental point of view. To remedy this, effective, economical and sustainable depollution processes are constantly being developed and adsorption remains a widely used method in the treatment of water contaminated by drug discharges [1]. The wide presence of antibiotics in these waters has raised serious concerns because they are excreted in urine and reach urban wastewater treatment plants where they can escape degradation and thus contaminate the environment [2]. Gamma irradiation has long proven itself. It showed that materials can be developed into new materials [3] whose application and use properties are different. These results pushed us to use this pretreatment technique for raw materials to study its behavior on the chemical composition before the design of new composite adsorbents.

2. Experimental

The composite adsorbents are synthesized in the form of beads by the extrusion method. The beads gelled in a crosslinking bath of 2% calcium chloride, and formed (Na-A, Na-A/OPP, Na-A/OPPWI, Na-A/OPPDI, Na-AI/OPP) are dried after several washes and stored until use until. Different characterizations were applied to the composite absorbents, namely the pH at zero charge point, the measurement of the specific surface area according to the BET method, the identification of functional groups by FTIR, etc. Spyramicin was quantified by UV-visible at the experimental wavelength of 232nm. The adsorbate used was prepared based on an antibiotic with the trade name spyramicin, manufactured by SAIDAL spa in the industrial zone of Oued S'mar, in de-ionized water.

3. Results and Discussion

The evolution of the adsorption capacity of the beads synthesized for the elimination of spyramicin as a function of time is presented in Fig. 1.

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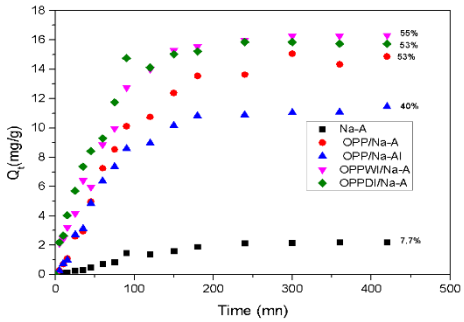

Figure. 1: Influence of time on the adsorption capacity of spyramicin by the synthesized composite adsorbents.

4. Conclusions

In the present work, the synthesis of adsorbent composite materials in the form of beads was carried out. Different states (native and after irradiation with gamma ionizing radiation) of the materials were used. The application of the synthesized composite adsorbents in the tests of the adsorption kinetics of spyramicin showed that the prepared materials have a capacity to retain pollutants. The highest adsorption rate reaches 55% with Na-A/OPPWI. The adsorption kinetics of this material is well described by the pseudo-first order model.

5. Acknowledgements

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