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Adsorption of Ni^{2+} ions onto newspaper adsorbent from aqueous solution

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Abstract Our work consists in valorizing wastepaper of newspaper (NPP) in the setting of the water treatment that constitutes of paper of newspaper to throw in the nature. The retraining and the means to follow for valorize this garbage of way to save resources of wood. We achieved experiences of Nickel adsorption on the paper of newspaper used after washing with water distilled for the homogeneity of our adsorbent and the elimination of the anchor. These experiences showed that pH, temperature and initial concentration of Ni^{2+} are important parameters in the metallic ion fixing on the surface of the adsorbent. For the survey of output of Nickel adsorption on the paper of newspaper we noted that it increases according to the report. The survey of the effect of the temperature as thermodynamic parameter has showed that for increasing variation of 20 °C until 50 °C a considerable increase of the capacity and output of the adsorption of Ni^{2+}(5.78 mg/g). Otherwise, we note that the time of balance is about 3 h for the survey of the adsorption kinetics.

Key words: Removal; newspaper; Nickel; adsorption; kinetic study; thermodynamic study.

Introduction

Today, the recovery of paper wastes constitutes a significant loss in our daily life and can be evaluated as a low cost adsorbent and biomaterial. The papers are mainly composed of cellulose, lignin and hemicelluloses and contain alcoholic, carboxylic, sulfonic and phenolic functional groups which can fix cationic compounds by electrostatic interactions. The charge of the pure cellulose surface is anionic. The old newspaper fibers were bleached with H_2O_2 and treated with KOH and NaOCl and tested Ni (II) adsorption. The regenerated cellulose reached 98% for the removal of Ni (II) ions in the literature. The present study aims to the removal of Ni (II) by adsorption onto NPP.

Preparation of NPP

The recovered newspapers were cut into 2 cm × 2 cm form and washed with distilled water at 60 °C to obtain NPP with a good homogeneity. NaClO (5%) and biodegradable soap are added to bleach and disperse the ink and to remove dirt particles attached to NPP, the final product is dried at 80 °C

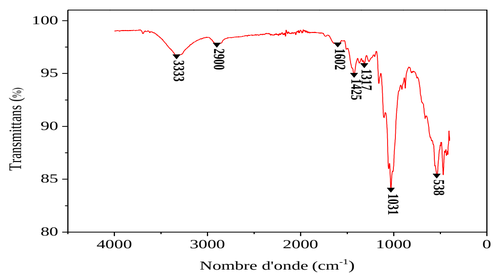


Fig.1. FTIR spectrum of NPP adsorbent.

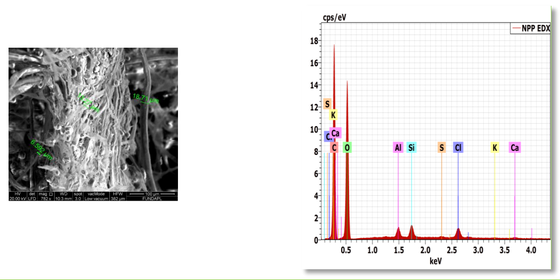
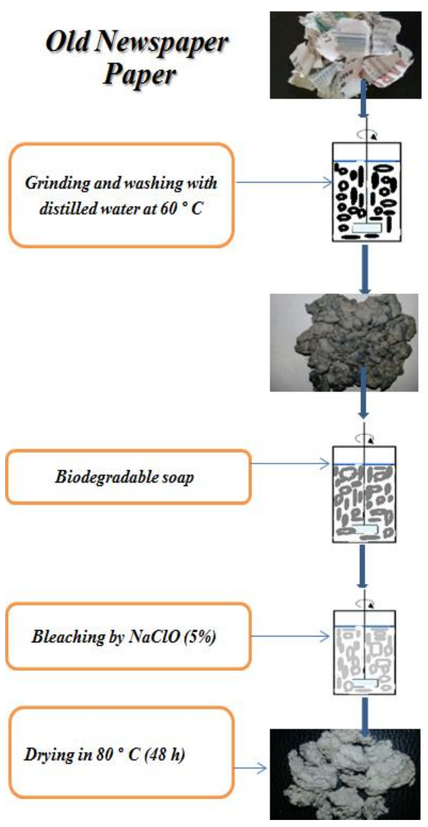


Fig. 2. Morphology and EDS spectrum of NPP adsorbent



Adsorption study

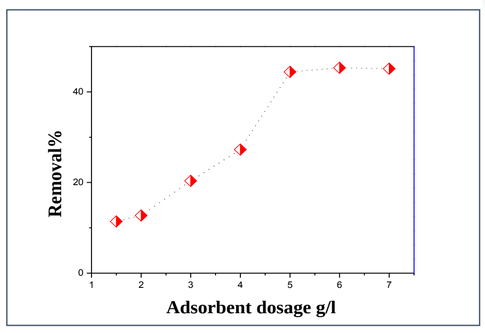


Fig 3. Effect of adsorbent NPP dose on Ni (II) removal and capacity adsorption

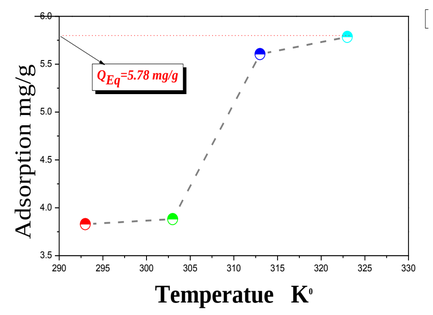


Fig 4. Effect of the temperature on the adsorption capacity of NPP.

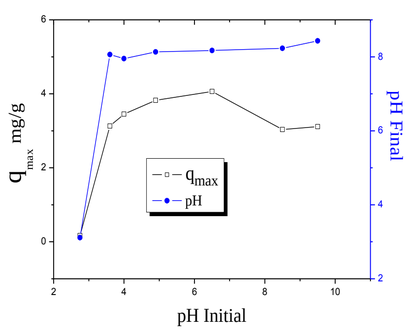


Fig. 5. Effect of the pH solution on the adsorption capacity of NPP

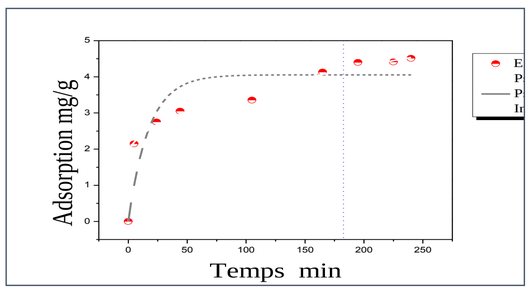


Fig. 6. Effect of the contact time on the adsorption capacity of NPP.

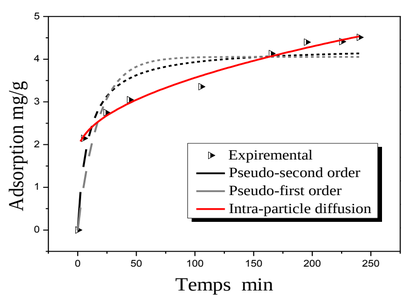


Fig. 7 Adsorption dynamics

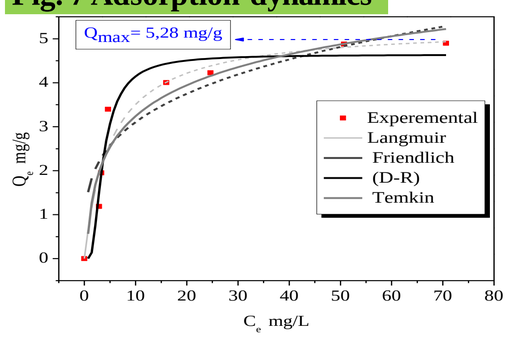


Fig. 8. Equilibrium adsorption isotherms

Conclusion

The influence of the contact time, pH, adsorbent dose and temperature were studied. The results obtained in the present work have shown that NPP can be used as recycled and effective adsorbent for the removal of a textile dye Ni (II) compared to other adsorbents.

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