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TECHNICAL FACULTY IN BOR



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Milan Nedeljković, dipl. ing.

Avram Kovačević, dipl. ing.

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THE EFFICIENCY OF NICKEL ION ADSORPTION FROM SYNTHETIC SOLUTIONS USING MULLEIN

Students: Veljko Pelić, Sandra Milićević

Mentors: Žaklina Tasić, Maja Nujkić

University of Belgrade, Technical Faculty in Bor, Bor, Serbia

Abstract

• Introduction

The aim of this paper is to determine the biosorption efficiency of the medicinal plant mullein (*Verbascum thapsus*), which has been used as waste material, in solutions of Ni (II) ions at different pH values.

• Materials and Methods

Nickel sulfate hexahydrate ($\text{NiSO}_4 \cdot 6\text{H}_2\text{O}$) was utilized to formulate the Ni(II) ion solutions. A stock solution with a concentration of 100 ppm was prepared. The solution's temperature was upheld at room temperature, as was the concentration of the solution itself. pH values were adjusted within the range of 3 to 7 through the addition of an HNO_3 solution and the utilization of a pH meter. A precise mass of 1g of mullein was weighed on a technical scale and subsequently transferred to a glass container containing the appropriate concentration solution. Following this, the mixture underwent homogenization for 1.5 hours at 400 rpm using a magnetic stirrer. Subsequent to this, filtration was executed using a Büchner funnel. The quantification of the concentration of residual Ni(II) ions in the solution after biosorption was performed using an Inductively Coupled Plasma Optical Emission Spectrometer (ICP-OES).

• Results

Based on the outcomes derived from the ICP-OES analysis, the removal efficiency of Ni(II) ions was computed in relation to the impact of the solution's pH value. The outcomes are as follows: 28.49% at pH = 3; 36.40% at pH = 4; 37.89% at pH = 5; 38.57% at pH = 6; and 39.14% at pH = 7 for an initial Ni(II) concentration of 100 ppm. Barquilha et al. achieved a removal percentage of 29.69% for Ni(II) ions using brown algae as a biosorbent. Meanwhile, in the study conducted by Shah et al., tea leaves from *Camellia sinensis* were employed as a biosorbent, yielding a removal percentage of 70.20% for Ni(II) ions within the pH range of 3-8. Notably, a decline in the biosorption of Ni(II) ions was observed after reaching pH 7.

• Conclusion

Based on the acquired results, it becomes evident that the efficiency of Ni(II) adsorption experiences a linear ascent with increasing pH values within the 3-7 range. The peak efficiency for Ni(II) adsorption is recorded at 39.14% under a pH of 7. But if we compare the results it is evident that mullein at this pH range isn't the best adsorbent for nickel ions.

Keywords: *Biosorption, ICP-OES analysis*

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