

AMMONIUM REMOVAL FROM AQUEOUS SOLUTION IN PRESENCE OF ORGANIC COMPOUNDS, USING BIOCHAR FROM BANANA LEAVES. COMPETITIVE ISOTHERMS MODELS

Fernanda Pantoja¹, Sándor Beszédes², Tamás Gyulavári³, Erzsébet Illés⁴, Gábor Kozma³, András Sági³ and Zsuzsanna László²

¹ *Doctoral School of Environmental Sciences, University of Szeged, H-6720 Szeged, Hungary*

² *Department of Process Engineering, University of Szeged, H-6725 Szeged, Hungary*

³ *Department of Applied and Environmental Chemistry, Institute of Chemistry, University of Szeged, Rerrich Béla Sqr. 1, H-6720 Szeged, Hungary.*

⁴ *Department of Food Engineering, University of Szeged, H-6725 Szeged, Hungary
e-mail: fliceth@hotmail.com*

Abstract

With the imminent threat of water contamination and its increasingly expensive treatment, the challenge of finding solutions with environmentally friendly and low-cost systems, operations and materials to address the imperative of conserving essential resources. Biochar can remove a wide range of pollutants from water such as ammonium, however, the effectivity of adsorption may be affected by other pollutants of wastewater. Thus, this study aims to determine the efficiency of biochar as an adsorbent of ammonium in aqueous solutions in the presence of some selected organic compounds as bovine serum albumin (BSA), lactose and acetic acid. The biochar was produced from banana leaves at 300°C, then modified with NaOH. Biochar was characterised by SEM and FTIR, specific surface area was determined by BET measurements. Batch experiments were carried out to investigate the ammonium adsorption capacity and the competitive adsorption mechanism. Results show that the highest ammonium removal rate occurs at pH 9 with a dose of 500mg of biochar in 2 hours. The maximum NH₄⁺ adsorption capacity was 0.97 mg/g without organic compounds according to Langmuir model in a monolayer condition. The isotherm model that best fits the data obtained is Harkins-Jura model. The presence of organic compounds in the aqueous solution significantly impacts the adsorption of ammonium by biochar. The data obtained during competitive adsorption experiments are fitted to the Aranovich-Donohue isotherm model.

Keywords: biochar, water treatment, adsorption, ammonium removal, competitive adsorption.

Acknowledgements

Project no. 2019-2.1.11-TÉT-2020-00152 has been implemented with the support provided by the Ministry of Innovation and Technology of Hungary.