



KARAKTERIZACIJA PRIRODNIH ORGANSKIH MATERIJA U VODI KOAGULISANOJ POLIALUMINIJUM HLORIDOM

CHARACTERIZATION OF NATURAL ORGANIC MATTER IN WATER COAGULATED USING POLYALUMINIUM CHLORIDE

APSTRAKT

U radu je prikazana karakterizacija prirodnih organskih materija (POM) u sirovoj podzemnoj vodi koja se koristi za vodosnabdevanje grada Kikinda i vodi koagulisanom polialuminijum hloridom. Ispitan je i potencijal sirove i tretirane vode ka formiranju trihalometana (THM) i halosirćetnih kiselina (HAA), kao dominantnih dezinfekcionih nusproizvoda u vodi. Sirovu vodu karakteriše dominantna zastupljenost hidrofobne frakcije fulvinskih kiselina (74% u odnosu na ukupan DOC), koja se delimično uklanja koagulacijom i u vodi koagulisanom dozom od 5 mg Al/l iznosi 65%, odn. 52% pri dozi od 10 mg Al/l. Iako dominantno prisutna, frakcija fulvinskih kiselina nije ispoljila najveću reaktivnost ka formiranju nusprodukata dezinfekcije. U sirovoj vodi utvrđena je različita reaktivnost POM ka formiranju THM i HAA, gde se u slučaju trihalometana kao najreaktivnija frakcija pokazala hidrofилна ne-kiselina, a u slučaju HAA hidrofилна kiselina frakcija. Nakon koagulacije, sve frakcije POM su ispoljile veoma sličnu reaktivnost ka formiranju THM i HAA, koja je sa druge strane značajno smanjena u poređenju sa sirovom vodom.

Ključne reči: podzemna voda, prirodne organske materije, koagulacija, trihalometani, halosirćetne kiseline, frakcionisanje

ABSTRACT

This paper presents the results of the characterization of natural organic matter (NOM) in raw groundwater used for water supply in Kikinda, and investigates its coagulation using polyaluminium chloride, as well as the potential of the raw and treated waters towards the formation of trihalomethanes (THMs) and haloacetic acids (HAAs), the most dominant disinfection by-products in water. The raw water is characterized by the predominance of the hydrophobic fulvic acid fraction (74% of the total dissolved organic carbon, DOC), which is partially removed by coagulation, such that its contribution in coagulated waters is 65% and 52% of total DOC after doses of 5 mg Al/l and 10 mg Al/l, respectively. Although the fulvic acids have the greatest share of all the NOM fractions, they do not express the greatest reactivity towards the formation of disinfection by-products. In the raw water, the hydrophilic non acidic fraction was shown to be the most reactive towards THM formation, whereas the hydrophilic acidic fraction was the most reactive towards HAA formation. After coagulation, all fractions of NOM exhibited very similar reactivities to both THM and HAA formation, which were significantly reduced compared to the raw water.

Key words: groundwater, natural organic matter, coagulation, trihalomethanes, haloacetic acids, fractionation

1. UVOD

U akvatičnim ekosistemima prirodne organske materije (POM) se najčešće javljaju u dva oblika, kao (i) alohtone POM terestrijalnog porekla, gde su najzastupljenije huminske materije (huminske i fulvo kiseline) i (ii) autohtone POM, uključujući jedinjenja koja nastaju kao proizvod aktivnosti nekih algi i cijanobakterija (*Pivokonsky i sar., 2015*). Sadržaj i karakteristike POM u vodi značajno se razlikuju u zavisnosti od lokaliteta i uslovljene su biogeohemijskim ciklusom i faktorima okruženja. Dodatno, čak i na istom lokalitetu može doći do značajnih varijacija u karakteristikama POM, usled sezonskih promena, padavina, topljenja snega, poplava ili suša, što je naročito značajno za

1. INTRODUCTION

In aquatic ecosystems, natural organic matter (NOM) usually occurs in two forms, such as allochthonous NOM of terrestrial origin, with the most common humic substances covering humic and fulvic acids and the autochthonous NOM, including compounds that are formed as a product of the activity of algae and cyanobacteria (*Pivokonsky et al., 2015*). The content and characteristics of NOM in water can vary significantly depending on the locality and are influenced by biogeochemical cycles and environmental factors. Furthermore, even at the same site there can be significant variations in the NOM characteristics, due to seasonal changes, precipitation, snowmelt, flooding

Univerzitet u Novom Sadu, Prirodno-matematički fakultet, Departman za hemiju, biohemiju i zaštitu životne sredine, 21000 Novi Sad, Trg Dositeja Obradovića 3, E-mail: jelena.molnar@dh.uns.ac.rs

University of Novi Sad, Faculty of Sciences, Department of Chemistry, Biochemistry and Environmental Protection, Trg Dositeja Obradovića 3, Novi Sad 21000, R. Serbia, E-mail: jelena.molnar@dh.uns.ac.rs