

## REAKTIVACIJA ISTROŠENOG AKTIVNOG UGLJA I PONOVA UPOTREBA U TRETMANU OTPADNIH VODA

### REACTIVATION OF THE USED-UP ACTIVATED CARBON AND REUSE IN WASTEWATER TREATMENT

**Vanja B. Gujaničić<sup>\*1,2</sup>, Miloš S. Nikolić<sup>1</sup>, Negovan D. Ivanković<sup>1</sup>, Marija P. Marković<sup>2</sup>,  
Rajko M. Gujaničić<sup>1,3</sup>, Stevan Lj. Stupar<sup>1,4</sup>**

<sup>1</sup> Univerzitet odbrane u Beogradu, Vojna akademija, Beograd

<sup>2</sup> Vojska Srbije, Tehnički opitni centar, Beograd

<sup>3</sup> Vojska Srbije, 246. bataljon ABHO, Kruševac

<sup>4</sup> Ministarstvo odbrane, Vojnotehnički institut, Beograd

*Svest o značaju zaštite životne sredine je jedan od glavnih prioriteta postojećeg društva. U cilju rešavanja problema otpadnih voda bogatih pesticidima, vršeno je ispitivanje efikasnosti uklanjanja organofosfatnog pesticida diazinona iz vodenih rastvora adsorpcijom, koristeći regenerisani aktivni ugalj iz cedila zaštitne maske. Ispitivan je uticaj vremena kontakta, početne koncentracije organofosfata (diazinon), pH vrednosti rastvora i doze adsorbenta na mehanizam adsorpcije. Rezultati istraživanja su pokazali da doza adsorbenta i pH vrednost utiču na kinetiku i kapacitet adsorpcije. Eksperimentalni podaci dobijeni nakon uspostavljanja ravnoteže analizirani su linearnim, nelinearnim metodama najmanjih kvadrata, kao i grafičkim metodama pseudo-prvog, pseudo-drugog i drugog reda, kao i unutarčestičnom difuzijom. Takođe, ispitano je i poklapanje sa Lengmirovim i Frojndlihovim izotermkim modelima, pri čemu je zaključeno bolje poklapanje sa Frojndlihovim izotermkim modelom. Utvrđeno je da regenerisani aktivni ugalj iz filtera zaštitne maske može naći primenu u tretmanu otpadnih voda, čime se postiže dvostruka korist za Vojsku Srbije i zaštitu životne sredine, postupkom uklanjanja kontaminanta iz otpadnih voda i ponovnom upotrebom filtera sa isteklim resursom.*

**Ključne reči:** *aktivni ugalj; diazinon; organofosforno jedinjenje; kinetika adsorpcije; adsorpcioni kapacitet*

*Awareness of the importance of environmental protection is on an ever-increasing level both in the public and in people's everyday communication. This topic is among the priorities of the Serbian Armed Forces, which harmonizes its norms and regulations with the legislation of the Republic of Serbia. The Serbian Armed Forces, as the carrier of many activities, creates different types of waste and the treatment of it must be in accordance with the applicable legislative norms. During the training and international courses with real toxic substances, certain amounts of waste water containing organophosphates are produced, which must be treated before discharge into the recipient. Another challenge for the Serbian Armed Forces is the expiration of certain material resources, such*

\* Corresponding author:

vanjagujanicic@yahoo.com

<https://orcid.org/0009-0000-9875-4051>

Negovan Ivanković: <https://orcid.org/0000-0003-0202-8210>

Stevan Stupar: <https://orcid.org/0000-0003-1255-6711>

*as a large number of strainers of protective masks with expired resources. During this research, we focused on finding solutions to these two problems. During the research, the possibility of using re-activated activated carbon from the strainer of the protective mask as an adsorbent for the removal of organophosphates from simulated wastewater was investigated. The influence of contact time, initial concentration of organophosphate (diazinon), pH value of the solution, dose of adsorbent and coexisting ions on the adsorption mechanism and the possibility of reuse was investigated. The research results showed that the dose of adsorbent and the pH value significantly influence the kinetics and capacity of adsorption. Sorption kinetics in the initial phase followed diffusion-controlled adsorption within the particle, and molecular size and hydrophobicity greatly influenced the sorption rate. Adsorption equilibrium was reached after 60 minutes. It has been shown that the reactivated activated carbon from the protective mask filter has a promising application in the treatment of wastewater, which achieves a double benefit for the Serbian Armed Forces, the removal of contaminants from wastewater and the reuse of filters with an expired resource that were ballast in the storage facilities of the Serbian Armed Forces.*

**Key words:** *activated carbon; adsorbent; reuse; organophosphorus compound; adsorption capacity*