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**Faculty of Technology and Metallurgy, University of Belgrade**
**Institute for Technology of Nuclear and Other Mineral Raw Materials**
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# REMOVAL OF COPPER BY PELLETIZED FLY ASH

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Recent investigations are focused on the possibility of waste utilization as potential adsorbents in wastewater treatments. Industrial by-products and wastes are almost zero-cost raw materials and at the same time, their utilization can contribute to the solution of management problem by improving the material efficiency within the several industrial activities. Fly ash as a potential hazardous solid waste produced like a by-product in power plants worldwide in a million tons has attracted researches interest for years. Fly ash has potential application in wastewater treatment because of its major chemical components (alumina, silica, ferric oxide, calcium oxide, magnesium oxide, and carbon), and its physical properties such as porosity and large surface area. However, the micron particle size distribution of the fly ash (0.5 μm to 200 μm) that gives fly-ash poor hydraulic properties is the one that limits the use of this material in wastewater treatments. This obstacle can be effectively overcome through the agglomeration process such as pelletization. Fly ash can be efficiently pelletized using cement as a binder. For the production of the pellets with the satisfying mechanical properties, the required amount of the cement as a binder is 10 %. The dosage of plasticizer up to 3 % in relation to the amount of the cement, additionally improves the mechanical properties. Under the investigated pelletizing conditions, more than 80 % of the obtained pellets are suitable for the application in continuous systems for wastewater purification, from the particle size distribution point of view (1.0 – 5.0 mm). Obtained pelletized fly ash has been used as a sorbent for copper removal in a batch system. Copper adsorption by fly ash was examined using a range of initial Cu concentrations (25.0 to 600.0 mg $dm^{-3}$). Solid – liquid ratio was $^{1}100$, and the investigated contact time was 120 min. After equilibration, all suspensions were centrifuged and the concentrations of the remaining Cu in supernatants were determined using AAS. The obtained results indicate that the rise of initial concentration leads to the higher adsorbed amount of the copper. The experimental data were analyzed using the Langmuir sorption model. According to this model, maximum adsorption capacity for copper removal by pelletized fly ash is 25.64 mg $g^{-1}$ and this is almost 3 times higher capacity compared to the one non-pelletized one (8.85 mg $g^{-1}$). The presence of cement leads to the higher pH value in the reaction solution (5.5 - 6.0) than in the one with micronized fly ash (4.6 – 5.1) and this higher pH value noticeably influence the removal efficiency.

**Keywords**: fly ash, pelletization, adsorption, Copper removal.