



Smectite clays of Serbia and their application in adsorption of organic dyes

Maja Milošević and Mihovil Logar

University of Belgrade, Faculty of Mining and Geology, Belgrade, Serbia

Colorants and dyes are currently available in over a 100.000 different species and several biggest industries are using them daily in their manufacture processes (textile, cosmetics, food industry, etc.). Since colorants are easily dissoluble in water they pass through filter membranes without further decomposing and in that manner they end up in the environment. The main goal of this work is to apply certain methods in determining the suitability of individual clay in adsorbing and removing colorants from polluted waters.

For this study we have chosen four different raw clays from three regions in Serbia: Svrlijig (B), Bogovina (Bo) and Slatina-Ub (C and V) and as colorant - methylene blue dye (MB (MERCK, for analytical purposes)). Experiments were carried out to determine the sample structure (XRD and IR), grain size (granulometry), cationic exchange capacity (CEC via spectrophotometry using MB) and adsorption capabilities (spectrophotometry and fluorimetry using MB).

XRD and IR data are showing that the samples are smectite clays where samples B i Bo are mainly montmorillonite while C and V are montmorillonite-illite clays. Granulometric distribution results indicate that samples B i Bo have smaller grain size, less than 1μ (over 60%) whereas the samples C and V are more coarse grained (40% over 20μ). This grain distribution is affecting their specific surface area in the manner that those coarse grained samples have smaller specific surface area. Cationic exchange capacity determined with methylene blue indicate that montmorillonite samples have larger CEC (B = 37 meq/100g, Bo = 50 meq/100g) and montmorillonite-illite samples smaller CEC (V = 5 meq/100g, V = 3 meq/100g). Fluorimetry measurement results gave us a clear distinction between those with higher and smaller adsorption capability. Montmorillonite samples (B and Bo) with higher CEC values and smaller grain size are adsorbing large amounts of methylene blue which is visible by absence of fluorimetric band corresponding to methylene blue. Montmorillonite-illite samples with smaller CEC values and coarser grain size are adsorbing very small amounts of methylene blue from the suspension which is visible by appearance of the methylene blue band.

Untreated, raw smectite clays of Serbia are efficient adsorbent material for removal of dyes from polluted waters. Samples from two regions especially, Bogovina and Svrlijig, are showing favorable adsorption results and they are representing good raw materials for purification of waste-waters containing dyes.

References:

- Jović-Jovičić, N., Milutinović-Nikolić, A., Gržetić, I., Jovanović, D.; Organobentonite as efficient textile dye sorbent; Chem. Eng. Technol. 2008, 31, No. 4, 567–574
- Žunić, M.J., Milutinović-Nikolić, A.D., Jović-Jovičić, N.P., Banković, P.T., Mojović, Z.D., Manojlović, D.D., Jovanović, D.M.; Modified bentonite as adsorbent and catalyst for purification of wastewaters containing dyes; Hem. ind. 2010, 64, No. 3, 193–199