Physico-chemical nanomaterials science

C.I. Direct Blue 71 sorption on the silica-alumina mixed oxide

M. Wiśniewska[1], S. Chibowski[1], M. Wawrzkiewicz[2], Z. Hubicki[2], V.I. Gun'ko[3], V.I. Zarko[3]

[1] Maria Curie-Sklodowska University, Faculty of Chemistry, Department of Radiochemistry and Colloid Chemistry, M. Curie-Sklodowska Sq. 3, 20-031 Lublin, Poland, E-mail: wisniewska@hektor.umcs.lublin.pl

[2] Maria Curie Sklodowska University, Faculty of Chemistry, Department of Inorganic Chemistry, M. Curie-Sklodowska Sq. 2, 20-031 Lublin, Poland

[3]National Academy of Science of Ukraine, Institute of Surface Chemistry, 17 General Naumov Str., 03164 Kiev, Ukraine

Mixed silica-alumina oxide consisted of 4% SiO_2 and 96% Al_2O_3 (SA96) was applied for the removal of direct dye (C.I. Direct Blue 71, DB71) from aqueous solutions and wastewater. Kinetic studies revealed that increasing initial dyes concentration from 10 to 30 mg/L and contact time from 1 to 240 min, the increase of the sorption capacities (q_t) occurred and the equilibrium of adsorption for DB71 is observed after 240 min. Sorption of the dye on SA96 takes place through a pseudo second-order mechanism rather than pseudo first or intraparticle diffusion. Experimental data fitted better to the Langmuir isotherm model than the Freundlich one. The monolayer sorption capacity (Q_0) was found to be 49.2 mg/g [1]. The presence of auxiliaries such as anionic surfactant (SDS) and sodium chloride on the removal of DB71 was investigated in the 10 mg/L DB71 – 0.1-1 g/L SDS or 5-20 g/L NaCl systems. The potentiometric titrations indicated that presence of dye, surfactant, electrolyte and wastewater change considerably the surface charge density of SA96 [1]. Adsorption of dye causes increase of the solid surface charge density ($_0$) and shift of pH_{pzc} point (pzc – point of zero charge) towards higher pH values. This is a result of formation of a greater number of positive surface sites caused by the interactions with anionic adsorbate.

1. *Wawrzkiewicz M., Wiśniewska M., Gun'ko V.I. Zarko V.I. Adsorptive removal of acid, reactive and direct dyesfrom aqueous solutions and wastewater using mixed silica-alumina oxide* // Powder Technol.-2015.**-278.-**P. 306-315.

Acknowledgement The research leading to these results has received funding from the People Programme (Marie Curie Actions) of the European Union's Seventh Framework Programme FP7/2007-2013/ under REA grant agreement n°PIRSES-GA-2013-612484.