Nanostructured surfaces

Adsorption and electrokinetic properties of activated carbon obtained from residue after supercritical extraction in the aqueous solution of poly(acrylic acid)

A. Nosal-Wiercińska[1], R. Pietrzak[2], M. Wiśniewska[3], P. Nowicki[2], I. Ostolska[3], O. Goncharuk[4]

[1] *Department of Analytical Chemistry and Instrumental Analysis, Faculty of Chemistry, Maria Curie- Sklodowska University, M. Curie-Sklodowska Sq. 3, 20-031 Lublin, Poland, e-mail:anosal@poczta.umcs.lublin.pl*

[2] *Laboratory of Applied Chemistry, Faculty of Chemistry, Adam Mickiewicz University in Poznań, Umultowska Street 89b, 61-614 Poznań, Poland*

[3] *Department of Radiochemistry and Colloids Chemistry, Faculty of Chemistry, Maria Curie- Sklodowska University, M. Curie-Sklodowska Sq. 3, 20-031 Lublin, Poland*

[3] *Chuiko Institute of Surface Chemistry, General Naumov Street 17, 03164 Kiev, Ukraine*

The starting material was residue after supercritical extraction of hops (**H**) powder with size range of 0.10 – 0.75 mm and moisture content in air-dry state of 5.6 %. The initial material was first subjected to pyrolysis (**P**) process at 500ºC. This process was carried out in a quartz tubular reactor heated by horizontal furnace under a stream of nitrogen with a flow rate of 170 mL/min. In the final temperature, sample was kept for 1 hour and then it was cooled in inert atmosphere. After that the char was subjected to physical activation (**A**) at temperature of 800ºC under a stream of carbon dioxide (rate flow 250 mL/min), for 1 hour.

The adsorption and electrokinetic properties (solid surface charge density and zeta potential) of obtained activated carbon (HPA) was determined in the aqueous solution containing poly(acrylic acid) - PAA. It was shown that the polymer with lower molecular weight (i.e. 2 000 Da) shows the greatest adsorption at pH 3. Under such conditions macromolecules assume the most coiled structure (the minimal dissociation of polymer carboxyl groups) and the electrostatic attraction between adsorbent and adsorbate occurs. Moreover, the PAA addition cases decrease of the solid surface charge density and zeta potential of HPA particles in relation to the system without polymer. This is result of the presence of polymer dissociated groups in the adsorption layer and the shift of slipping plane from the solid surface (due to poly(acrylic acid) adsorption.