



## **Hydrothermally prepared biochars from potato peels. Activation of biochars with phosphoric acid for use as sorbents for cobalt removal from wastewaters**

Evangelos Lakkovikotis, George Kyzas, Eleni Deliyanni, and Kostas Matis

Laboratory of General and Inorganic Chemical Technology, Aristotle University of Thessaloniki, Greece

In the present study, activated carbons (ACs) were hydrothermally prepared with an environmental friendly preparation route from biomass (specifically from potato peels). The prepared biochars were activated with phosphoric acid (chemical activation). The porous texture and the surface chemistry of the biochars and the relative activated carbons prepared were investigated and were compared to the activated carbon prepared and activated by pyrolysis, in one step procedure. Biochars and activated carbon materials were also characterized by Scanning Electron Microscopy (SEM) and Fourier Transform Infrared (FTIR) spectroscopy. The prepared activated carbons were used as adsorbents for the removal of cobalt from aqueous solutions. Batch experiments were performed to investigate the effect of physico-chemical parameters, such as pH, adsorbent dose, contact time, initial metal concentration and temperature. The kinetics of adsorption were studied by applying the pseudo-first order, pseudo-second order and intraparticle diffusion models. Equilibrium data were analyzed using Langmuir and Freundlich isotherm models. The thermodynamic parameters such as the change of enthalpy ( $\Delta H^0$ ), entropy ( $\Delta S^0$ ) and Gibb's free energy ( $\Delta G^0$ ) of adsorption systems were also determined and evaluated.