



Competitive adsorption of phenol and heavy metal ions onto titanium dioxide (Dugussa P25)

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Received 29 January 2011; Accepted 22 September 2011

ABSTRACT

Single-solute adsorption of phenol (chosen as an organic pollutant) and single-solute adsorption of four heavy metal ions (Cu(II), Zn(II), Cd(II) and Fe(II) chosen as minerals pollutant) onto titanium dioxide (Dugussa P25) nanoparticles in aqueous suspension are studied. Temperature effect is studied for copper and for phenol. Furthermore, competitive adsorption between phenol and each metal cation is also studied. Phenol is dosed via HPLC while heavy metals are quantified by Atomic Adsorption Spectrophotometry. The single-solute adsorption results were well fitted by Freundlich, Langmuir, Temkin and Kiselev isotherm models. This study showed that adsorption of the different pollutants onto TiO₂ is favourable and adsorption energy was calculated as well. Moreover it is concluded that phenol adsorption and heavy metal cation adsorption do not proceed with the same mechanism. In the case of competitive adsorption in the 4 studied bisolute systems (phenol in presence of each heavy metal ion), the adsorption is decreased from 30% to 60% in comparison to single-solute results. Moreover, the Shiendorf-Rebuhn-Sheintuch (SRS) - a Freundlich type modified equation - was successfully applied. This competitive model described and simulated well the bisolute isotherms results for both phenol and metal ion. The competition influence is based on competitive coefficients a_{ij} .

Keywords: Adsorption; Isotherm; Competition; TiO₂; Phenol; Heavy metal

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