Adsorption of nitrophenol compounds from aqueous solution by cross-linked starch-based polymers

Qian Zhang a, Chukwunonso Peter Okoli b, Lingqing Wang a, Tao Liang a,*

aInstitute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences, Beijing 100101, China, Tel. +8610 64888297; email: zhangqian@igsnrr.ac.cn (Q. Zhang), Tel. +8610 64888993; email: wanglq@igsnrr.ac.cn (L. Wang), Tel. +8610 64859781; Fax: +86 10 64888297; email: liangt@igsnrr.ac.cn (T. Liang)

bDepartment of Chemistry, University of Ibadan, Ibadan, Nigeria, Tel. +2348038948432; email: nonsokoli@yahoo.com

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ABSTRACT

Two kinds of cross-linked starch polymers were synthesized and used as adsorbent materials for the adsorption of o-nitrophenol (o-NP), p-nitrophenol (p-NP), 2,4-dinitrophenol (2,4-DNP) and 2-s-butyl-4,6-dinitrophenol (DNBP) from aqueous solutions. Results from adsorption experiments showed that the polymer 1 prepared by 4,4´-methylene-bis-phenyl-diisocyanate (MDI) as cross-linking agent exhibited higher adsorption behaviors than that of the polymer 2 prepared by hexamethylene diisocyanate (HMDI). Equilibrium and thermodynamic of four nitrophenols on polymer 1 were further studied. Analyzed experimental data showed that the Freundlich model fitted the isotherm data better than the Langmuir model of the four nitrophenols onto polymer 1. The thermodynamics for the adsorption of the nitrophenols on polymer 1 were estimated in the range of 303–333 K. It has been found that the values of Gibbs free energy (ΔG) became more negative with decreasing temperature, which indicated that the adsorption process was more favorable at low temperature.

Keywords: Cross-linked starch polymers; Nitrophenols; Adsorption