



Zinc remediation of aqueous solutions by natural hemp fibers: batch desorption/regeneration study

Lavinia Tofan^a, Carmen Paduraru^{a,*}, Ovidiu Toma^b

^aFaculty of Chemical Engineering and Environmental Protection, Department of Environmental Engineering and Management, "Gheorghe Asachi" Technical University of Iasi, 73, Prof. Dr. D. Mangeron Street, 700050 Iasi, Romania, Tel. +40 232 278688/2244; emails: lavinia_tofan@yahoo.com (L. Tofan), cpadur2005@yahoo.com (C. Paduraru)

^bFaculty of Biology, Department of Biochemistry, "Al. I. Cuza" University of Iasi, 20A Carol I Blvd., 700505 Iasi, Romania, Tel. +40 232 201630; email: otoma@uaic.ro (O. Toma)

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ABSTRACT

A hemp waste material resulting from the textile industry has previously been shown to be a very efficient material in removing Zn(II) from diluted aqueous solutions. In this work, batch studies on desorption and multiple sorption–regeneration cycles for zinc(II) removal by natural hemp fibers have been carried out. The best desorption results were performed in acidic medium, where the protons in solution replaced the Zn(II) ions on the loaded hemp. The efficiency of Zn(II) desorption with 0.1 M hydrochloric acid is higher than that achieved using sulfuric acid of the same concentration. The amount of Zn(II) desorbed by 0.1 M HCl, 0.1 M H₂SO₄, and 5% NaCl increases sharply in the first 15–20 min of the process, attaining values that subsequently stay almost constant (for 0.1 M HCl) or slightly increase (for 0.1 M H₂SO₄ and 5% NaCl). The sorptive potential of the tested hemp remains almost unchanged after three cycles of sorption–desorption of Zn(II) from solutions with a high mg Zn/g of hemp in the initial ratio. The results of this study are important in order to demonstrate that regenerated hemp could be used for zinc metal removal from water sources without the threat of the sorbent becoming another source of zinc pollution for the environment.

Keywords: Desorption; Regeneration; Zinc; Hemp; Aqueous solution

*Corresponding author.