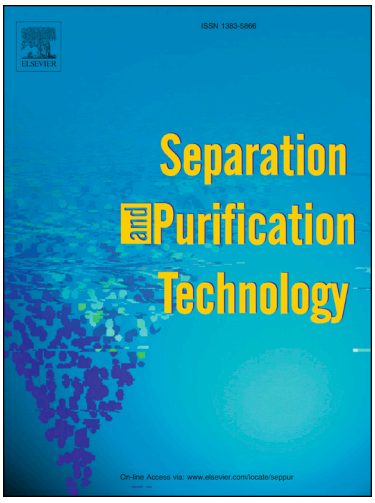

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Electron beam irradiated sheep wool – prospective sorbent for heavy metals in wastewater

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Abstract

Sheep wool water-washed in ultrasonic bath and slightly pre-dried was irradiated by accelerated electron beam applying dose of (0-350) kGy. The samples underwent sorption examination with Cr(III), Cd(II) and Pb(II). Sorption of Cr(III) by the irradiated wool investigated at unified concentration of 24 mmol.dm^{-3} for each absorbed dose showed intensive increase of Cr(III) sorption up to 3.13 x against the non-irradiated sample. It is concluded that some residual humidity in irradiated wool, being a rich oxygen source, enhances sorption due to faster cysteic acid formation. Sorption experiments with Cr(III), Cd(II) and Pb(II) ions of lower concentration up to 1.4 mmol.dm^{-3} individually indicated equal sorption as for non-irradiated wool up to 0.4 mmol.dm^{-3}. Beyond this concentration the sorption for the non-irradiated wool was lower compared with irradiated wool for any dose. The sorption increase depending on dose was different for particular doses. The order of the sorption in mg ion/1 g wool is in conformity with published data and correlates with size of the ionic radii (Pb(II)>Cd(II)>Cr(III)).

Keywords: sheep wool; electron beam irradiation; sorption; heavy metal; Cr(III)-Cd(II)-Pb(II).

Highlights

- Wool with residual humidity and irradiated electron beam showed upper sorption
- Sorption by native and irradiated wools is equal up to 0.4 mmolar concentration
- Beyond that concentration the sorption of irradiated wool is higher always
- The order sorption is Cr(III) < Cd(II) < Pb(II)
- Sorption by exposed wool is 3.13x higher than native one for 24 mmolar Cr(III)

1. Introduction

Pollution of the environment provokes concerns for safety of human health. Air, water and soil suffer from some contamination and, with the final consequence, this pollution impairs people.

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