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“Synthesis and characterisation of ion exchange resins for the removal of arsenic and selenium from waters”

Abstract

Contaminated waters and staple foods are the main exposure routs for arsenic and selenium for the human being. Less quantities of arsenic or selenium already can cause cancer or serious neurological injuries. As a consequence of these physiological risks, the WHO decreased the limiting value of arsenic and selenium in drinking water to 10 μg/L.

The various methods of water treatment that are used (flocculation, precipitation, ion-exchange etc.) have proved their quality in practice, but can only in restricted extent be suitable for the employment in rural regions, because of their technical requirements and operating expenses.

This thesis deals with the synthesis and applicability of noval chelating ion-exchange resins with functional S-heterocycles on the basis of substituted formazanes and tetrazolium derivates that shall be able to reduce the arsenic and selenium concentration from waters.

The preparative aim, i. e., the synthesis of the central structure and some additional variants including thio crown ethers and C1-spacer was achieved. The results of the sorption studies support the basic structural conception of this project, because significant affinities of the polymeric-bonded S-heterocycles towards selenium (IV,VI) and arsenic (V) were detected. Both the different anchor groups and residual reactive sites of the starting polymers considerably affect the overall sorption behaviour towards As and Se species in their different oxidation states via ionic and coordinative interactions, as well redox reactions. These particularities of the multi-functional ion exchangers have to be taken into consideration for practical use.