CHANGES OF CHROMIUM AND LEAD CONCENTRATION, AND POSSIBILITY OF ITS APPLICATION TO ESTIMATE RELATIVE AGE OF ALLUVIAL DEPOSITS – LABORATORY AND FIELD EXPERIMENTS

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Laboratory and field experiments were done to analyse migration ability of chromium and lead in alluvial sediments of the Obra river valley. Main research problem was to determine the relative age of the deposits using method of changes of lead and chromium concentration. These two chemical elements were chosen because of its low abilities to migrate (Robertson, 1975 in: Ball, Izbicki, 2004; Witczak, Adamczyk, 1995) and because of the fact that centres of weaving industry were functioning in the lower course of the Obra river between the XVIth and the XIXth century. One of the main ingredients of paints used at that time were the compounds of chromium in its trivalent form (alum) and lead (lead sulphate) (Mączak, 1955). Laboratory tests were done in a column of dimensions 40x20x200 cm, which was filled with alluvial sediments (coarse sands, fine sands and peats). The column was equipped with piezometers and syringes to observe water level and to collect water samples. During particular stages of experiments, water and sediment samples were collected to analyze changes of chromium and lead concentrations. Besides, laboratory tests regarding to horizontal migration of studies elements were done. To verify laboratory results, field experiments were done using pipes, which were beat into floodplain deposits and then supplied with Cr and Pb compounds. At the end of the field tests, the deposits were drilled from pipes and subjected to chemical analyses. Besides, alluvial sediments vertical profiles were collected from the Obra river valley floor to determine “natural” (unaffected by field tests) contents of chromium and lead. Next, organic sediments from bottom part of the profiles were dated using C^{14} method. Results of laboratory experiments has shown that chromium and lead can be used to estimate the relative age of alluvial deposits. The highest concentrations (Cr: 550 mg kg^{-1}; Pb: 380 mg kg^{-1}) occurred in the surface layer of alluvial deposits placed in the column. In the remaining part of the device, much lower Cr and Pb contents were noted (5-25 mg kg^{-1}). The results of field experiments has shown that trivalent Cr has, in comparison with Pb and hexavalent Cr, lower ability to migrate vertically in floodplain deposits. However, it should be noted that migration of trivalent chromium was more intensive than observed in laboratory conditions. Changes of “natural” Cr and Pb concentrations and C^{14} datings has shown that, presumably, it is possible to apply the changes to estimate the relative age of alluvial sediments, excluding profiles from near bead zone of floodplain.