TREATMENT OF ACID MINE DRAINAGE WITH USE OF STRONGLY ACID CATEX AND WEAKLY BASIC ANNEX

ÚPRAVA KYSLÝCH BANSKÝCH VÔD S POUŽITÍM SILNE KYSLÉHO KATEXU A SLABO BÁZICKEHO ANEXU

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Abstract:
In this paper, we have focused on the possibilities of treatment of the acid mine drainage (Acid Mine Drainage - AMD) arising in the environment of Sokolov brown coal deposits in NW Bohemia. A long-term intensive surface mining lead to oxidation of sulphide minerals and subsequently to the production of AMD. Studied AMD, are typical by low pH (2.7) and high concentrations of sulphate ions SO_4^{2-} (1579.8 mg.l^{-1}), Fe (20.0 mg.l^{-1}), Mn (5. 2 mg.l^{-1}), Al (15.2 mg.l^{-1}) and K (9.7 mg.l^{-1}). The main problem in terms of AMD contamination is high content of sulphates. The limit value of sulphates contained in the water that are discharged into surface waters in the Czech Republic is 300 mg.l^{-1}. Mine water samples taken from the open pit Jiří from the holding tank Lomnice were modified in two steps at the laboratory of the Technical University in Ostrava. Pre-treatment of AMD consisted of adding $Ca(OH)_2$ (in the form of 10% solution) that lead to increased pH (7) and precipitation of Fe and Mn in the form of their oxides and hydroxides. After the sediment removal (filter for the quantitative analysis KA 4) and subsequent microfiltration, water samples were modified by using ion exchange membranes working on the base of synthetic resins. Pre-treated water was poured through the first column filled with strongly acidic cation exchanger - catex (200 ml) and then through a second column filled with weakly basic anion exchanger - annex (200 ml). Experiments confirmed the effectiveness of the treatment system for modification of 10 litres of AMD. Concentration of the observed elements and inorganic salts in the treated water were as follows: SO_4^{2-} (9.6 mg.l^{-1}), Fe (<0.10 mg.l^{-1}), Mn (<0.03 mg.l^{-1}), Al (<0.02 mg.l^{-1}) and K (1.5 mg.l^{-1}). The results confirm the effectiveness of the resin ion exchange membranes for treatment of acid mine drainage of that nature.

Key words:
Acid mine drainage, ion exchange membrane, sulphates, Fe, Mn, catex, annex