MINERAL REACTIONS IN SURFACE LIGNITE MINING PITS: THEIR INFLUENCE ON SULFATE CONTENTS IN SURFACE WATER AND GROUNDWATER IN A DISUSED MINING PIT IN LUSATIA / GERMANY

1Göttlicher, J. and 1Pohlmann, M. 1Forschungszentrum Karlsruhe GmbH, Hermann-von-Helmholtz-Platz 1, D-76344 Eggenstein-Leopoldshafen, Germany, e-mail: joerg.goettlicher@itc-wgt.fzk.de

Redeposition of sediments from surface lignite mining pits leads to oxidation of primary iron sulfides enhancing acidification processes. Mineral reactions there can be divided into time dependent stages: formation of (1) water soluble Fe(II,III) sulfates, (2) jarosites [(K,Na,H3O,NH4)Fe3(SO4)2(OH)6] and (3) hydrolysis of them due to changes of pH an Eh by re-rising of groundwater. Mineral reactions in the disused pit at Plessa (Lusatia) - closed down since 1958 - are now in-between stage II and III. Jarosite has been identified in the dumps and in sediments of the acidic mining lake. Its first occurrence could not be traced back. But in active pits jarosite can't be detected before 1 to 2 years in the dumps until sufficient Fe(II) and alkali ions released from silicates by sulfuric acid are available. Schwertmannite [Fe16O16(OH)12(SO4)2] and goethite were identified in the lake sediments indicating instability of jarosite. Laboratory experiments show goethite as a product of jarosite hydrolysis. Transformation of sulfate containing minerals in sulfate depleted ones is an additional source of sulfate until anaerobic conditions will be initiated (e.g. by microbes) to produce sulfides. As long as jarosites are present their Fe/S ratio of 3/2 indicates lack of mobile iron which has to be taken into account when the sulfate is immobilized in FeS2. Using information on the type and distribution of sulfur in solid phases, on its proportion released as sulfate and on their transport mechanisms and paths to surface- and ground-water, remediation processes in acidic dumps and mining lakes can be optimized.