

561e Value Recovery from Mine Waters - Environmental, Engineering Socioeconomic and Scientific Opportunities and Challenges

Subhas K. Sikdar and Jan ROGUT

Worldwide mining activities generate the drainage streams, the polluted water solutions, containing the dissolved metal salts and dispersed solid hazardous components, the cause of environmental damages and source of expenses influencing badly the economy of extraction of minerals and coals. The lecture presents the updated review of the laboratory and demonstration scale results of the collaborating teams from the exploratory research focused on elaboration the separation processes and systems for production from contaminated mine water the stream of purified water for agriculture and communal use integrated with manufacturing the market ready, value added materials for different application. It has been assumed that cash flow from selling the quality water produced from mine drainage streams and the value of special materials directed for niche markets could participate in noticeable part in cost coverage of necessary rehabilitation of mining and post mining areas. The analysis starts up from the draft inventory of volumes, flow rates and compositions of streams of mine drainage waters in Europe, US and Canada with highest potential of playing the role of the alternative raw solutions for production of chemicals, sorbents, catalysts, and pigments of standard quality for established markets as well as the material basis for manufacture of micro- and nano - structured materials for specialized, novel applications. To illustrate the concept and opportunities the following case studies taken from the own exploratory research have been chosen for review: · production of ochre sorbents for phosphorus removal from surface waters, · Preparation of iron oxides and alumina particles coated internally with metallic iron for destruction of chlorinated solvents and/or for cementation of traces of heavy metals from underground waters in the reactive barrier systems, · controlled precipitation of nano - structured ferrites for effective capture of traces of mercury from landfill leakage · Manufacture of composite, oxide sorbents for deep desulfurization of flue gases at high temperatures, · production of high temperature resistant particles for use in chemical looping combustion processes The selected mature and the most prospective innovative ways of production of listed above materials have been analyzed next to present the engineering and economic challenges and to define the research needs for urgent development the new area of sustainable mining technology – the recovery of value from contaminated mine water. In defining the preferential areas for further research the attention has been paid to the stiff restrictions in availability of technical infrastructure in the expected locations of the majority of production plants at abandoned mines in peripheral and rural regions of the world. It has been concluded that the new technology should be seen as the research area of vigorous international collaboration, the potential subject for global scale joint research and implementation initiative in environmental and mining technologies.