Institute of Mineral Resources Engineering | RWTH AACHEN UNIVERSITY

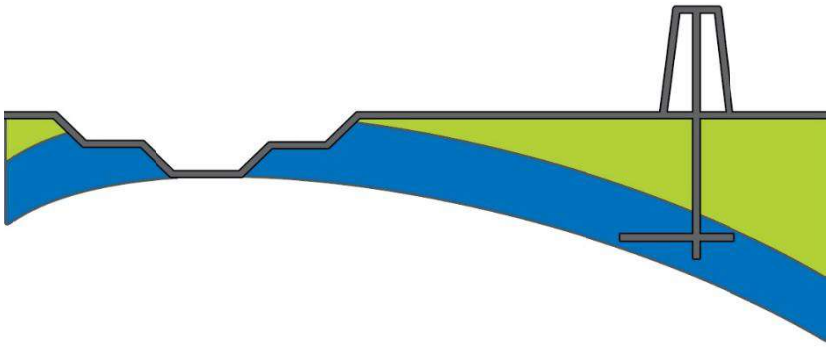
Aachen International Mining Symposia (AIMS 2016)

First International Conference

Mining in Europe

18 - 19 May 2016

RWTH Aachen University, Aachen, Germany



Abstract Volume

www.aims.rwth-aachen.de

Lottermoser BG & Lehnen F (editors)
2016
Abstracts of the First International Conference Mining in Europe
18 - 19 May 2016, Aachen, Germany
Institute of Mineral Resources Engineering, RWTH Aachen University

Production of Alkali Activated Materials from Chalcopyrite Tailings and Industrial Wastes

K Komnitsas
School of Mineral Resources Engineering, Technical University Crete, Greece

M Galetakis
School of Mineral Resources Engineering, Technical University Crete, Greece

D Zaharaki
School of Mineral Resources Engineering, Technical University Crete, Greece

During the last years, the need for waste valorisation is increasing and is in line with the principles of a zero-waste approach and circular economy. Alkali activation of various mining and metallurgical wastes for the production of construction and other materials looks like a very promising and sustainable waste management approach. This experimental study aims to investigate the alkali activation potential of chalcopyrite tailings obtained from the Hellenic Copper Mines Ltd, Nicosia, Cyprus, when combined with fly ash from the Megalopolis power station in Peloponnese, Greece and ferronickel slag from the LARCO S.A. plant in Larymna, prefecture of Lokris, central Greece. Specimens were produced by alkali activation of each raw material or their combinations using a solution consisting of NaOH, distilled water and sodium silicate solution. The resulting paste was cast in cubic metal moulds of 5 cm edge and remained at room temperature for two hours. When the paste hardened the specimens were demoulded, sealed in plastic bags, heated at 60 or 80 °C for 24 hours, cured for 7 days at room temperature and subjected to compressive strength testing using an MTS load frame. The effect of the activating solution molarity and the different mixing ratios of the raw materials on the compressive strength of the produced specimens was investigated. The morphology of the final products was elucidated through XRD, SEM and FTIR studies. The results show a limited alkali activation potential for chalcopyrite tailings since the strength of the specimens produced did not exceed 10 MPa. However, when tailings were mixed with slag or fly ash alkali activation occurs and the produced specimens acquire much higher strength. For example, mixing slag with chalcopyrite tailings (weight ratios 80 and 20%, respectively) resulted in the production of specimens with compressive strength exceeding 40 MPa.