Title: Calcium Extraction from unmilled BOF slag for Energy Efficient CO_2 Sequestration using Graphical Analysis and Application for Acid Mine Drainage treatment

Mwengula G. Kahilu and Jean Mulopo

Sustainable Energy and Environment Research Group, School of Chemical Engineering, University of Witwatersrand PO Box 3, Johannesburg, Wits 2050, South Africa. Phone: +27 11 717-7507; Fax: +27 11 717-7604; Email:jean.mulopo2@wits.ac.za

Production of calcium carbonate by indirect carbonation of BOF (Basic Oxygen Furnace) slag usually requires a calcium extraction stage to promote the dissolution of calcium in solution. Several lines of evidence suggest that the grinding of BOF slag to smaller particle size accelerates the calcium leaching process at the expense of a high energy input and further environmental constraints such as dust management. In order to minimize the excessive consumption of energy due to grinding, this study focused on the optimization of calcium extraction from **unmilled** BOF slag using 2 conventional solvents namely ammonium chloride (NH_4Cl) and ammonium nitrate (NH_4NO_3) and graphical analyses based on simple extraction mass balance. The study was conducted at the experimentally determined threshold solvent-to-slag mass ratio of 10/1, to avoid the dissolution of impurities such as iron, silicon, magnesium and manganese and guarantee minimum extraction equipment costs. The results obtained using umilled BOF slag show that the efficiency of calcium extraction from the unmilled BOF slag reached ~ 75% for NH_4NO_3 and ~69% for NH_4Cl in 2 extraction stages. A calcium carbonate precipitation yields of 80% was reached at 25^{o}C and 6.5 bars. Scanning Electron Microscopy (SEM) analysis of the dry calcium carbonate precipitate obtained showed that it is mostly dependent on the flow rate of CO_2 injected in the carbonation reactor and the system pressure. Finally, the precipitated calcium carbonate was evaluated for the treatment of acid mine drainage.

Keywords*: Calcium extraction, BOF slag, Mass balance, carbonation, calcium carbonate, Acid mine drainage, graphical analysis*

Biography

Gentil Mwengula has completed his Msc in chemical and metllurgical engineering at the age of 33 years from the University of the Witwatersrand. He has been working in mining company from 2012 to 2018. He is currently doing is PhD in chemical engineering at the same university on waste managment.

Presenting author details
Full name: Mwengula Kahilu Gentil
Contact number:+27785939663
Twitter account:
Linked In account:gentilkahilu@gmail.com/ Ir Gentil Kahilu Linked In
Session name/ number:
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