

## Calcium Extraction from unmilled BOF slag for Energy Efficient CO<sub>2</sub> Sequestration using Graphical Analysis and Application for Acid Mine Drainage treatment

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### Abstract

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<sub>4</sub>Cl) and ammonium nitrate (NH<sub>4</sub>NO<sub>3</sub>) 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 unmilled BOF slag show that the efficiency of calcium extraction from the unmilled BOF slag reached ~ 75% for NH<sub>4</sub>NO<sub>3</sub> and ~69% for NH<sub>4</sub>Cl in 2 extraction stages. A calcium carbonate precipitation yields of 80% was reached at 25oC 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<sub>2</sub> injected in the carbonation reactor and the system pressure. Finally, the precipitated calcium carbonate was evaluated for the treatment of acid mine drainage.

Gentil Mwengula has completed his Msc in chemical and metallurgical 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 his PhD in chemical engineering at the same university on waste management.

### Speaker Publications:

1. "The admissibility of the exceptional use of armed protection for humanitarian relief operations and personnel under international humanitarian law"; dialnet. / 2012 / 277.012
2. "Production and evaluation of precipitated calcium carbonate from steelmaking slag"; WIREDSpace/ 10539/28782
3. "How can adherence to International Law be better encouraged during Security Sector Reform? An analysis of the British Army's professionalisation of indigenous forces."; University of Exeter, 10871/21799.

[8th Global Summit and Expo on Pollution Control](#); Webinar- August 24-25, 2020, 2020.

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### Biography: