Effects of mechanical activation on physicochemical properties and alkaline leaching of boron concentrate

Yingzhe Xu, Tao Jiang, Mi Zhou, Jing Wen, Wanying Chen, Xiangxin Xue

PII: S0304-386X(16)30766-6
DOI: doi: 10.1016/j.hydromet.2017.05.014
Reference: HYDROM 4580

To appear in: *Hydrometallurgy*

Received date: 20 October 2016
Revised date: 12 March 2017
Accepted date: 16 May 2017

Please cite this article as: Yingzhe Xu, Tao Jiang, Mi Zhou, Jing Wen, Wanying Chen, Xiangxin Xue , Effects of mechanical activation on physicochemical properties and alkaline leaching of boron concentrate, *Hydrometallurgy* (2017), doi: 10.1016/j.hydromet.2017.05.014

Effects of mechanical activation on physicochemical properties and alkaline leaching of boron concentrate

Yingzhe Xu[a], Tao Jiang[a,b,c*], Mi Zhou[a,b,c], Jing Wen[a], Wanying Chen[a], Xiangxin Xue[a,b,c]

[a] *School of Metallurgy, Northeastern University, Shenyang 110819, Liaoning, China*

[b] *Liaoning Key Laboratory for Recycling Science of Metallurgical Resources, Shenyang 110819, Liaoning, China*

[c] *Liaoning Key Laboratory for Ecologically Comprehensive Utilization of Boron Resource and Materials, Shenyang 110819, Liaoning, China*

Abstract Boron concentrate is one of the major products created during the magnetic separation and gravity treatment of ludwigite. Nevertheless, achieving high B_2O_3 leaching efficiency in alkaline solution is difficult owing to its low B_2O_3 grade. This study proposes a mechanical activation (MA) method for the pretreatment of boron concentrate and describes the changes in B_2O_3 leaching rate of boron concentrate as a function of different ball-milling conditions. This work examines the changes in the physicochemical properties change of samples arising as a result of the MA process, in particular by PSD, BET, SEM, XRD, FTIR and TG-DSC analyses. The experimental results show that particle size, specific surface area, crystal structure, stability of chemical bonds, energy accumulation and the B_2O_3 leaching rate of boron concentrate are all significantly affected by the milling process. The B_2O_3 leaching rate exhibits an initial increase as the rotation speed and milling time are increased, and the optimum MA conditions are established as 500 rpm and 60 min. Under these conditions, the B_2O_3 leaching rate increases from 67.52% (unmilled sample) to 89.47%. The decrease in particle size from 13.2 μm to 6.2 μm and the

* Corresponding author: School of Metallurgy, Northeastern University, Shenyang 110819, Liaoning, China
E-mail address: jiangt@smm.neu.edu.cn (T. Jiang).