

RHEOLOGICAL CHARACTERIZATION OF SUSPENSIONS GENERATED FROM COPPER ORES O VARYING MINERALOGICAL FEATURES AT GRINDING CONDITIONS

Leopoldo Gutiérrez^{1,2}, Andrés Ramírez¹, and Luver Echeverry¹

¹Department of Metallurgical Engineering, Universidad de Concepcion, 4070371 Concepción, Chile

²Water Research Center for Agriculture and Mining (CRHIAM), University of Concepcion, 4070411 Concepción, Chile

*Correspondence: lgutierrezb@udec.cl

ABSTRACT

An important stage of copper processing is grinding as it is responsible for more than 60% of the energy consumption as well as of plants production. All the grinding phenomena strongly depend on the rheological behavior of the slurries generated from the mixture of the fine particles generated in the process, and water. The operational results of grinding circuits indicate that one of the variables that has significantly impacted its performance is associated with the rheological behavior of the treated suspensions. Additionally, it is observed that the rheological behavior varies significantly depending on the mineral blends processed.

The objective of this work was to analyse the effect of the ore type on the rheological behavior of the suspensions generated from 7 ore samples of varying mineralogical characteristics using seawater. Rheological flow curves were obtained by using the *infinite gap approach* technique in a Haake VT-550 rheometer. The effect of pH, solids content, sodium hexametaphosphate and sodium silicate on the rheological behavior of the resulting suspensions was studied.

The results indicated a wide range of rheological behaviors that are strongly influenced by the type of mineral. The results clearly show that the solids content of the suspensions has an important effect on the yield stress. This result is very important for mining operations since minor variations in the control of the solids content in the secondary grinding circuit can have important effects on the pulp transport in the mills. The results also show that lime addition generates an increase in the yield stress of suspensions, which is associated with the precipitation of magnesium and calcium hydroxyl-complexes in seawater. These compounds generate particles aggregation and an increase in the yield stress and viscosity of the pulp. This conclusion is a relevant precedent to be considered in other operations that also use seawater. Finally, sodium hexametaphosphate and sodium silicate showed no significant effects on the rheological behavior of the suspensions.

Rheological characterization of suspensions generated from copper ores o varying mineralogical features at grinding conditions

Acknowledgments: We thank Centro CRHIAM Project ANID/FONDAP/15130015, project ANID/FSEQ/210002 for financial support. L.G. thanks projects ANID/ FONDECYT /1211705 and ANID/ACT210030.