

Tannins in mineral processing and extractive metallurgy

J. Rutledge and C. Anderson

Graduate student and professor, respectively, Colorado School of Mines, Golden, CO, USA

Background

Tannins are organic, wood-derived compounds that have many applications in industry, including in leather production chemical and petroleum processing, and froth flotation. The most commonly used form comes from two types of trees that grow in southeastern South America. This valuable material, called quebracho, is extracted from the inner cores of the trees, or the heartwood. Historically, quebracho has been used to depress calcite from fluorite.

Research aim

The purpose of this research is to investigate the use of tannins as a depressant in the froth flotation of fluorite and polymetallic sulfide ores. Fundamental surface chemistry experimental work, including adsorption density analysis, zeta potential analysis and microflotation, was conducted to help provide a better understanding of the behavior of tannins and how they are to be used in industrial-scale applications.

Materials and methods

Fundamental studies were carried out with pure minerals, while bench-scale flotation was done with ores. A General Electric TOC machine was used to determine the adsorption density, a Microtrac analyzer was used to measure zeta potential, a Partridge-Smith cell was used for the microflotation, and a Denver cell was used for the bench-scale flotation.

Results

A comparison of different tannin types was conducted to determine the best recovery of fluorite while depressing calcite. The microflotation of pure minerals proved that there were differences between using quebracho, chestnut and wattle tannins. In Fig. 1, the upper graph of with quebracho tannin had better fluorite recoveries than that with wattle tannin under the same conditions.

Conclusion

Quebracho tannin was shown to have the best performance among the tannin types in the flotation of fluorite and calcite. Future work will be conducted on quebracho and polymetallic sulfide flotation.

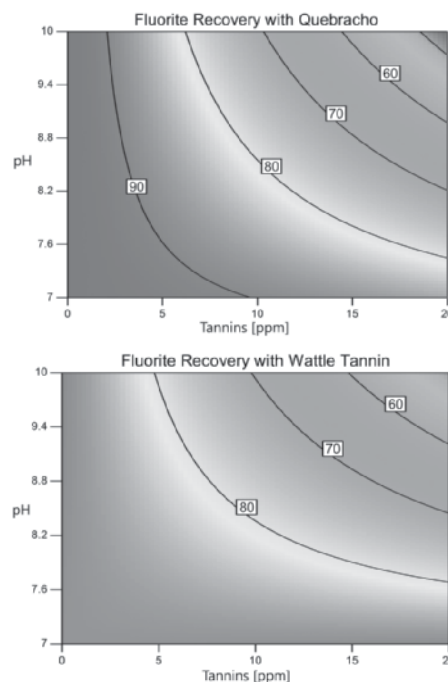


Figure 1 — Statistical modeling showing the floatations of fluorite with quebracho and wattle tannin.