

## Apatite Flotation Using Fruits' Oil as Collector and Sorghum as Depressant

**Authors :** Elenice Maria Schons Silva, Andre Carlos Silva

**Abstract :** The crescent demand for raw material has increased mining activities. Mineral industry faces the challenge of process more complexes ores, with very small particles and low grade, together with constant pressure to reduce production costs and environment impacts. Froth flotation deserves special attention among the concentration methods for mineral processing. Besides its great selectivity for different minerals, flotation is a high efficient method to process fine particles. The process is based on the minerals surficial physicochemical properties and the separation is only possible with the aid of chemicals such as collectors, frothers, modifiers, and depressants. In order to use sustainable and eco-friendly reagents, oils extracted from three different vegetable species (pequi's pulp, macauba's nut and pulp, and Jatropha curcas) were studied and tested as apatite collectors. Since the oils are not soluble in water, an alkaline hydrolysis (or saponification), was necessary before their contact with the minerals. The saponification was performed at room temperature. The tests with the new collectors were carried out at pH 9 and Flotigam 5806, a synthetic mix of fatty acids industrially adopted as apatite collector manufactured by Clariant, was used as benchmark. In order to find a feasible replacement for cornstarch the flour and starch of a graniferous variety of sorghum was tested as depressant. Apatite samples were used in the flotation tests. XRF (X-ray fluorescence), XRD (X-ray diffraction), and SEM/EDS (Scanning Electron Microscopy with Energy Dispersive Spectroscopy) were used to characterize the apatite samples. Zeta potential measurements were performed in the pH range from 3.5 to 12.5. A commercial cornstarch was used as depressant benchmark. Four depressants dosages and pH values were tested. A statistical test was used to verify the pH, dosage, and starch type influence on the minerals recoveries. For dosages equal or higher than 7.5 mg/L, pequi oil recovered almost all apatite particles. In one hand, macauba's pulp oil showed excellent results for all dosages, with more than 90% of apatite recovery, but in the other hand, with the nut oil, the higher recovery found was around 84%. Jatropha curcas oil was the second best oil tested and more than 90% of the apatite particles were recovered for the dosage of 7.5 mg/L. Regarding the depressant, the lower apatite recovery with sorghum starch were found for a dosage of 1,200 g/t and pH 11, resulting in a recovery of 1.99%. The apatite recovery for the same conditions as 1.40% for sorghum flour (approximately 30% lower). When comparing with cornstarch at the same conditions sorghum flour produced an apatite recovery 91% lower.

**Keywords :** collectors, depressants, flotation, mineral processing

**Conference Title :** ICSRD 2020 : International Conference on Scientific Research and Development

**Conference Location :** Chicago, United States

**Conference Dates :** December 12-13, 2020