Using Two Alternative Vegetable Oil’s as Collector in Apatite Froth Flotation

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The Brazilian phosphate deposits are of igneous origin exhibiting a complex mineralogy where fluorapatite is the predominant mineralogical variety from the apatite group, this deposits still contain carbonatapatite and hydroxyapatite associated with secondary phosphates, iron oxides (magnetite, goethite and limonite), micas and minerals bearing niobium, titanium and barium. The flotation process as a separation and enrichment of the acceptable levels by the P$_2$O$_5$ market (35%) is the most efficient. Brazilian mineral industries use synthetic collectors from international companies. Many of these oils were initially produced to sort out the demand for biodiesel production, with their market being diminished and farmers having their request reduced, impacting the income of many families, besides what using natural oils is more ecofriendly and sustainable. In the present study were used collectors obtained by the cold saponification of vegetable oil of macaúba (Acrocomia aculeata (Jacq.) Lodd. ex Mart., purchased from a regional producer), pinhão-manso (Jatropha curcas L., donated by EMBRAPA Agroenergia), or the mixture of both in the proportion of 50% (m/m). The saponification process was carried out with the addition of 5 g of each oil or their mixture in 20 g of distilled water and stirred for 5 min. Subsequently, 10 mL water solution of NaOH (10% w/v) was added while stirring was continued for 5 minutes. After this period, the solution was doused with water until 100 g of total mass was reached and homogenized for another 10 min. Microflotation tests were performed on modified Hallimond tubes with a collector concentration of 2.5 mg.L$^{-1}$ at pH 8, and 1 g of apatite less than 100#. The conditioning time was 7 min and 1 min for flotation. An application rate for tests of 40 cm$^3$.s$^{-1}$ and a pressure of 10 psi. The results below (figure 1) point to the best recovery of the macaúba oil (1) reaching 90% recovery of the apatite, while the pinhão-manso (2) obtained only about 15%. The influence of the mixture of oils can be observed, reducing the recovery of the mixture of oils (3) to 10% when compared to macauba (1). The means are different by the Tukey test at 95% confidence. As each vegetable oil has characteristic lipid profiles, this differentiated composition seems to directly influence the ability to collect the mineral. It is concluded that the oils present employment potential as collectors, requiring more tests to optimize the mixture of them.

![Figure 1](image.png)  
**Figure 1**– Recovery of apatite for oils composition: (1) 100% macaúba; (2) - 100% pinhão-manso and (3) 50% of each oil. Different letters are statistically different by the Tukey test (p < 0.05).