# Evaluation of Eco-Friendly Bio-Collectors Derived from Moroccan Biomass Waste for the Flotation of Low-Grade Phosphate Ore

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## Abstract:

Waste management and valorization are essential components of the circular economy, which aims to optimize resource use and minimize environmental impacts. The enrichment of low-grade phosphate ore through flotation using bio-based reagents represents a promising and emerging approach in the mineral processing industry. An innovative approach involves utilizing certain types of waste as functional agents, such as collectors in flotation processes. This strategy not only reduces dependence on conventional reagents but also lowers environmental impact, enhances resource efficiency, and aligns with the principles of sustainable development. This study focuses on exploring the use of three eco-friendly bio-collectors, two of which are derived from Moroccan biomass waste, as an innovative strategy to enhance the flotation of low-grade Moroccan phosphate to evaluate the selectivity of apatite flotation over gangue minerals. The fatty acid chemical profiles of the collectors were characterized, and their potential as bio-collectors in phosphate ore flotation was evaluated. The flotation performance