

## **A microbial technology approach using bioleaching for low grade metals extraction - a review**

### **ABSTRACT**

Bioleaching is a promising technological advancement of metal refinement which arises from the application of beneficial microorganism. Low grade ores and electronic waste (ewaste) that contains significant amounts of "critical metals" such as the rare earth elements (REE) are commonly discarded in waste heaps which causes major pollution. The over mining of the primary resources of REE is becoming a major concern considering its limited supply and increasing demand. Bioleaching application is able to provide not only a simpler method of metal leaching but are also cost-effective in comparison to chemical leaching and thermohydrometallurgy. By applying bioleaching in major e-waste treatments, we can extract back significant amounts of REE with lower cost and better environmental impacts. This review provides studies which discuss the backgrounds of bioleaching, its methods and mechanisms, direct comparison of chemical leaching, pyrometallurgy, hydrometallurgy and bioleaching in terms of its economic and environmental aspect and lastly its future in the mining industry in Malaysia.