

**UNIVERSITI TEKNOLOGI MARA**

**PRESENT AND FUTURE OF  
THERMOPHILIC BIOLEACHING IN  
DEVELOPING COUNTRIES**

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## **ABSTRACT**

The growing of population and development contribute to the increasing demand of metals. Thus, the mining industries plays important role in supplying to this needs. However, the difficulties in the process of obtaining metal become constraints and many strive to improve the mining technology. One of the important aspect are the recovery and extraction of metal from its metal ore. In order to improve this process, a technique known as bioleaching is introduced. As diversity of the microorganism has been raising interest of engineers, researchers and scientists, the idea to make use of microorganism into mining technology became possible. Thus, the microbial hydrometallurgy and mineral processing (bio-hydrometallurgy) of metal sulphides is currently well established technology. Studies shows that the overall rate of bioleaching increases when the operating temperature increases. The increases in operating temperature result in increasing value of the rate of chemical oxidation, thus increase the rate of bioleaching. Hence, there is growing interest in operating at a higher temperature to achieved higher leach rates and lower operational cost. This lead to the used of thermophilic microorganism in the bioleaching process. This research project further investigate the present and future of thermophilic bioleaching in developing countries.

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# **CHAPTER 1**

## **INTRODUCTION**

### **1.1 BACKGROUND RESEARCH**

#### **1.1.1 History/Background of Bioleaching**

In the mining technology, hydrometallurgy is a method obtaining metals from their ores. It is a technique involving the use of liquid for the recovery of metals from ores, and concentrates. Ore is a type of rock that contains mineral with important element including metals. The ores can be extracted from earth through mining and then further refined. The grade or concentration of an ore mineral, or metal, will directly affect the costs associated with mining the ore. Thus, interest using biohydrometallurgy increases as it is an economical alternative for treating specific mineral ores especially for low grade ores.

Bio-hydrometallurgy is a combination of principle such as:

- i. made used of microorganism usually bacteria or archae (Bio),
- ii. process takes place in aqueous environment (hydro),
- iii. Deal with metal production and metal treatment (metallurgy).

There are few important processes in bio-hydrometallurgy such as bioleaching, bio-oxidation, bioremediation, bio-sorption and bioaccumulation. Bio-oxidation is a method of leaching where by the undesired metal are leached away and the desired metal remain in solid phase. Bio-sorption is a passive process where it does not require energy. These process absorbed contaminants onto the cellular structure. Bioaccumulation differ from bio-sorption as it is an active process, where substances such as pesticides or other chemicals accumulate in an organisms. Bioremediation is a treatment that uses microorganism to break down hazardous substances into non-toxic substances. (Rawlings D. , 1997)

Bioleaching on the other hand are the technology involves the extraction of useful element from ores by bacteria, the desired metal leached and solubilized. The difference