



## 17<sup>th</sup> Khwarizmi Youth Award

### Second Laureate Innovation

**Researcher:** Mahdokht Arshadi

**Project Title:** Bioleaching of electronic waste using two types of bacteria

**Supervisor :** Seyed Mohammad Mousavi

**Advisor Professor:** Mohsen Nosrati

**Collaborator Organization:** Tarbiat Modares University

**Field:** Biotechnology and Chemical Engineering



#### **Abstract:**

Among electronic waste, mobile phone and computer printed circuit boards are important targets which were chosen in this study as samples. To evaluate the effect of bioleaching on metal recovery, pure culture of *Acidithiobacillus ferrooxidans* and *Bacillus megaterium* were used. To maximize metal recovery, influenced factors were optimized using response surface methodology. Adaptation phase of *A. ferrooxidans* to samples was started at pulp density of 1 g/l and terminated at 20 g/l. To maximize Cu and Ni recovery simultaneously by using *A. ferrooxidans*, four factors including initial pH, initial ferric ions concentration, pulp density, and particle size were chosen. At optimal condition Cu and Ni were extracted totally from both samples. Simultaneous bioleaching of Au and Cu were studied by using *B. megaterium*. To optimize Au and Cu from mobile phone printed circuit boards (MPPCBs), factors of initial pH, pulp density and glycine concentration were selected at constant average particle size of 93 micron. At optimal condition, Au and Cu were recovered 3.6% and 71.45%, respectively. Using average particle size of 19 micron at optimal condition led to 3.35% and 85.22% of Au and Cu recover respectively. To examine copper elimination on Au recovery, the performance of *B. megaterium* was studied on the sample which *A. ferrooxidans* extracted its Cu content totally. The results showed that by using *B. megaterium* at optimal condition, 2.18% of gold from sediment was extracted. To optimize gold and copper extraction from computer printed circuit boards (CPCBs), initial pH, pulp density, glycine concentration, and particle size were studied. At optimal condition 36.81% and 13.26% Au and Cu, respectively, were extracted. To study the effect of copper elimination on gold recovery, the performance of *B. megaterium* was examined on the sample which *A. ferrooxidans* extracted its Cu content totally. Using both bacteria on a unique sample led to 63.8% gold extract.

