Feasibility Study on Biolixiviation of Cu, Mg, Ni, Pb and Zn from Mining Residues using Food Waste as Substrate

R. Galvez-Cloutier(1), A.Ouattara(2) and C. Mulligan (3)

1. Professor, Department of Civil Eng. Laval University, Quebec, Canada. G1K 7P4.
   rosa.cloutier@gci.ulaval.ca

2. Graduate student, Department of Civil Eng. Laval University, Quebec, Canada. G1K
   7P4

(3) Associate Professor, Department of Civil Eng., Concordia University, Montreal, Canada,
H3G 1M8

Precious metal extraction potential and identification of solubilization mechanisms were assessed using column tests. Mining residues were washed with organic acids produced from the culture of the fungi *Aspergillus niger* and *Penicillium simplicissimum*. Two types of mining residues were studied. The first coming from a Zn and Pb mine in New Brunswick (Canada) and the second one from a Ni mine in New Caledonia. Cu, Fe, Mn, Ni, Pb and Zn were in high concentration in the residues from the Canadian mine (from 1130 to 590 000 mg/kg of residues). Both residues are from different mineral backgrounds, the Canadian residues are pyritic with a high sulphur concentration (267 569 mg/kg of residues).

The results showed that various factors controlled the efficiency of the extraction. These factors arise from the mineral origin of residues and from the physico-chemical characteristics of the mixture of acid solution. During this project, metal distribution and mineral origin of the residues were evaluated using sequential selective extractions and scanning electron microscopy. The individual concentrations of acids constituting the mixture (citric, maltic, gluconic) were monitored using HPLC. Surface tension, pH and acid concentration were evaluated during acid production. In order to reduce

the process cost, three different organic residues were used as substrate (fruit skin, lacteous wastes and fruit juices).