CHARACTERIZATION OF ACIDOPHILIC BACTERIA IN SAMPLES OF WATER COMING INTO A REGION THAT SUFFERS INFLUENCE OF URANIUM MINE IN CALDAS (MG)

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INTRODUCTION

The Osamu Utsumi Uranium Mine is located in Poços de Caldas Plateau (Minas Gerais - Brazil), it is an open-pit mine. It was the first mine to extract uranium ore in Brazil, and it is located at “Unidade de Tratamento de Minério – Industrias Nucleares do Brasil (UTM-INB)”.

The fundamental condition for the bioleaching of the uranium ore is the presence of metallic sulfide, such as pyrite associated with the ore, which is found in the ore and in the waste at the (UTM). The action of acidophilic bacteria belonging to the genus *Acidithiobacillus* spp. is known to accelerate the generation of acid mine drainage: the oxidative bacterial action on pyrite produces sulfuric acid and ferric ion. However, these products provide a direct solubilization of uranium ore. The presented study aims to determine the chemical and microbiological characteristics on effluents of uranium mining from the UTM and in 'Antas' dam, which receives treated effluents originally from the UTM. We collected water samples from Pit Mine (CM), located within the UTM facilities and from site 41 (Antas dam) on July and October 2008.

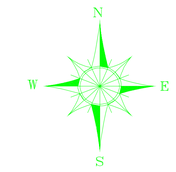
METHODOLOGY

Water sample

July and Outucber/2008

Waste Rock Piles	UTM-Interface environmental
CM	41

Pit Mine - Osamu Utsumi



Variable chemistry and biological

- Eh
- O_2
- SO_4^{-2}
- Condutivity
- U
- Zn
- Th
- F^-
- Fe^{2+}
- Fe^{3+}
- Total iron

- Heterotrophic Acidophilic Bacteria
- Heterotrophic Bacteria
- *Acidithiobacillus ferrooxidans*
- *Acidithiobacillus thiooxidans*

Antas Dam

41

RESULTS

Chemical characteristics (mg L^{-1}) and microbiological (MPN/mL^{-1})

	CM	41
A. f.	5,000 ± 4,300	351.5 ± 492.8
A. t.	950 ± 550	3 ± 0
pH	3.7± 0.4	6.65 ± 0.7
Fe^{2+}	0.34 ± 0.02	0.15 ± 0
Fe^{3+}	2.58 ± 0.82	0.19 ± 0.02
Total Iron	2.9 ± 1.59	0.22 ± 0.02
H. B. (pH 3)	16,840 ± 16,160	1.8 ± 0
H. B. (pH 5)	9,450 ± 4,550	1,001 ± 1,412.9

A. f. : Acidithiobacillus ferrooxidans n = 2
A. t. : Acidithiobacillus thiooxidans
H. B.: Heterotrophic Bacteria
MPN: Most Probable Number

Chemical characteristics (mg L^{-1})

	CM	41
Eh (mV)	524.7 ±524.7	218.7 ± 49.9
O_2	7,1 ± 0	8 ± 1.69
COND. (uS/cm)	2,535 ± 91.9	555 ± 296.9
Mn	88.3 ± 7.4	1.06 ± 0.25 (1)
Th	0,1 ± 0	< 0,02 ± 0
U	5.1 ± 0.87	0.02 ± 0.03
Zn	15.2 ± 3	0.02 ± 0
F^-	68.5 ± 6.5	2.34 ± 2.3 (1)
SO_4^{-2}	1,848.5 ± 16.5	244.8 ± 200

(1) :Res. 357 CONAMA (water class II) n = 2

CONCLUSION

The relative seasonal variation of some variables observed at site CM (low pH values, high densities of Acidithiobacillus spp. and heterotrophic acidophilic bacteria), shows that this site is one of the main sites of occurrence of acid mine drainage and action of bioleaching bacteria at the UTM, and it should be considered a critical spot, facing a possible decommissioning action. The sampling site located at the interface UTM-environment (site 41) was considered susceptible to acid mine drainage and to the activity of bacteria involved in bioleaching of metals.

SUPPORT

FAPEMIG Fundação de Amparo à Pesquisa do Estado de Minas Gerais

CNEN Comissão Nacional de Energia Nuclear

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