Title: BIODISSOLUTION OF PYRITE IN COAL SAMPLE USING STRAINS OF *Acidithiobacillus ferrooxidans* AND *Acidithiobacillus thiooxidans*.

Authors: PEREIRA, L.F. , BEVILAQUA, D.

Institution: Department of Biochemistry and Chemical Technology, Institute of Chemistry, São Paulo State University (Street Prof. Francisco Degni, 55 Quitandinha 14800-060 – Araraquara – SP)

Abstract:

Coal is the most important non-renewable energy source of fossil origin in the world. One of the major problem in using coal as an energy source is the presence of sulphur in the organic and inorganic (pyritic) form. During combustion of coal, SO_2 is released in the atmosphere, causing many environmental problems such as the formation of acid rain, beside this the corrosion of boilers and installations of underground metal pipelines. There are several physical and chemical processes to reduce sulfur in coal before combustion. However, such methods are very costly, with the use of extreme conditions of temperature and pressure. The biological method for desulfurization of the fossil fuel has proved to be more effective for this purpose. In this context, the present study evaluated the use of iron oxidizing bacteria and/or sulfur, *Acidithiobacillus ferrooxidans* and *Acidithiobacillus thiooxidans* in order to obtain a maximum reduction in pyritic content of coal supplied by carboniferous of Cambuí. For this purpose, bioleaching tests were performed in shake flasks at 150 rpm, 30 °C, 2.5% (w/v) of fine coal particles (125 mesh) and 5% (v/v) inoculum of the respective bacteria. During the tests, for the evolution of the liquid phase, the following parameters were monitored for a time period of 20 days: pH, Eh, Fe^{2+} and total iron. In abiotic control using *At. Ferrooxidans,* the Eh reached a value of 423 mV ($Ag/AgCl_{sat}$) having a solubilization of total iron 0.604 mmol L^{-1}, while the inoculated test, Eh values reached 522 mV ($Ag/AgCl_{sat}$) and 0.861 mmol L^{-1} of total iron solubilized. Already the test on abiotic condition using *At. thiooxidans* showed a value 399 mV ($Ag/AgCl_{sat}$) and solubilization total iron 0.044 mmol L^{-1} for a value of 441 mV ($Ag/AgCl_{sat}$) and 0,540 mmol L^{-1} total iron for inoculated system. Both assays demonstrated that the pyrite associated with coal is easily solubilized using these bacteria as catalysts in the reaction. The quantification to full oxidation of sulfide to sulfate in each condition will still be analyzed by ASTM.

Keywords: pyritic coal, *At ferrooxidans*, *At thiooxidans*, bioleaching

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