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Effect of Bacterial attachment to surface of pyrite on bioleaching efficiency using indigenous acidophilic bacteria

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This study investigated the efficiency of bioleaching and characteristics of bacterial attachment to pyrite surface which affects direct contact oxidation of insoluble sulfide mineral using indigenous acidophilic bacteria living in a hot acidic spring near Hatchobaru thermal electricity plant, Japan. The results of the batch experiments showed that as the bacteria grew in the growth-medium the pH of the growth-medium decreased and Eh increased. And the contents of both Fe and Zn in bacteria incubation sample exhibited higher than in the absent bacteria sample after 30 days from inoculation. In the SEM analysis, we observed the bacteria with the various shapes and size on the pyrite surface after 8 days from inoculation. The bacteria was observed rod-shaped with 4.01$\sim$5.38 micrometer in length, rod-shaped in sizes of 1.06 to 1.73 micrometer and round-shaped microbes in sizes of 1.79$\times$3.05 micrometer to 1.38$\times$2.69 micrometer, a linear arrangement of round-shaped with 1.15 to 1.98 micrometer, round-shaped microbes with shrunken forms on the pyrite surface and an attachment of edges of round-shaped microbes and the straight attachment of rod-shaped to the pyrite surface after 8, 17, 28, 42 and 113 days from inoculation, respectively. Additionally, through SEM analysis we found a number of clustered Fe-hydroxides and spindle-shaped crystals of gypsum which coated the pyrite surface 50 days after inoculation. This indicates that the secondary minerals such as Fe-hydroxides and gypsum crystal play a significant role of decreasing the efficiency of bioleaching.