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Improvement in gold grade from iron-oxide mineral using reduction roasting and magnetic separation

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Microwave has a wide range of applications in mineral technology, metallurgy, etc. It is an established fact that microwave energy has potential for the speedy and efficient heating of minerals and in a commercial context may provide savings in both time and energy. Microwave heating is being developed as a potential thermal pre-treatment process, because of its unique advantages over the differences of ore minerals in absorbing microwaves. The aim of this study was to investigate the improvement in Au grade from iron-oxide mineral using reduction roasting and magnetic separation. The characteristics of iron-oxide mineral were analyzed using chemical, XRD and reflected light microscopy. The reduction roasting using microwave and magnetic separation experiments were examined under various conditions (reducing agent and chemical additive). The results of XRD and reflected light microscopy showed that the iron-oxide mineral mainly composed of illite, quartz and hematite. The iron-oxide mineral had an Au, Ag, Fe contents of 6.4, 35.1 and 155,441.1 mg/kg, respectively. The results demonstrated that the improvement in Au by reduction roasting using microwave (frequency of 2.45GHz, intensity of 5kW) and magnetic separation (magnetic field intensity of 9,000 Gauss) were effective processes. The Au content in iron-oxide mineral from 6.4 mg/kg to 14.2 mg/kg was achieved within microwave exposure time of 10min (reducing agent(PAC) ratio = 50 : 50, 5% of chemical additive(Soda ash)).

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