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TOPICS:

- Renewable Energy & Energy Conversion
- Environmental Technologies
- Earth Resources Engineering
- Metallurgy and Material Science

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CONTENT

4E: Energy	4
Toshinori Matsushima Recent development of perovskite solar cells in Kyushu University.....	4
Otabek Nigmatov, Toshihisa Ueda Solid Combustion Experiments: Evaluation of flame spreading velocity over a soil with varying surface temperature	5
Komei Asano, Takehiro Esaki, Yuichi Sugai Fundamental Study on In-situ Hydrogen Generation of Crude Oil in Reservoir	11
Shukur Gofurov, Dilbar Bozorova, Zukhra Kadirova, Oksana Ismailova Bi based photocatalyst for water splitting: Effect of doping	12
A.O.Pulatov, K.A.Boboniyozov Conversion of Electric Power Supply for Motors at the Navoi Thermal Power Plant	13
4E: Earth	14
Hajime Miki Recent innovation for copper processing, hydrometallurgy and its application for Uzbekistan	14
Yuichi Sugai, Futo Ishibashi, Takehiro Esaki, Junpei Kumasaka Experimental Study on the Use of Nanoparticles to Improve the Efficiency of CO ₂ Geological Storage	15
Siyuan Yanga, Keyao Li, Sokhibjon Matkarimov Fundamental study on the growth process of interfacial microbubbles in an air-supersaturated solution	16
Kazuo Sasaki Earthquake sensor alarm system	17
Daniyarov Berdakh, Hajime Miki, Gde Pandhe Wisnu Suyantara, Kadirova Zukhra, Akhmadjonov Oybek, Ziyatov Daminbek, Daminova Shakhlo Selective flotation of molybdenite and chalcocite using hydrogen peroxide	19
K. Sanakulov, U.A. Ergashev Rational scheme for processing especially resistant gold sulphide ores using combined technologies	20
U.Z.Sharafutdinov, I.M.Razhabboev, V.D.Davlatova, N.B.Kilichev Study of the movement of rhenium in the technological process of mining and processing of uranium production	21
Sultonov Khojiakbar, Khojiev Shokhrukh, Soatov Asadbek, Esonova Mohinur Effect of temperature on the selective oxidation of iron in the Cu-Fe-S system	22
D.M.Rashidov, M.B.Khushvaktov, Sh.E.Abdurakhmonov, O.E.Abdurakhmonov Spent sulfuric acid catalysts, potential vanadium sources	23
D.B.Makhmaredjabov, D.O.Yavkochiva, S.K.Nosirkhodjaev, S.T.Matkarimov, S.Yang, E.O.Amankulov To study for the extraction of copper from sulfuric acid solutions by using of ion flotation	24
Soatov Asadbek, Khojiev Shokhrukh, Sultonov Khojiakbar, Esonova Mohinur Importance of increasing copper content in sulphide concentrate	25
S.K.Mamarakhimov, D.B.Kholikulov, A.A.Mirzaraimov, A.I.Turdiev Development of technology for recovery of metals from wastewater of the Kurgashinkan mine	26
Esonova Mohinur, Khojiev Shokhrukh, Farmonova Fotima, Muxammatjonova Manzura Development of technology for obtaining ore-fuel	

Effect of temperature on the selective oxidation of iron in the Cu-Fe-S system

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Selective oxidation of iron in the Cu-Fe-S system, often referred to as the roasting or smelting process, is an important step in extracting copper from sulphide ores. The temperature and other parameters play a crucial role in this process. Here's a brief overview:

1. Oxygen Concentration: The presence of oxygen is critical for the oxidation process. The higher the oxygen concentration, the more efficient the conversion of iron sulphides to iron oxides and sulphur dioxide [1].

2. Particle Size: Smaller particle sizes tend to oxidize more readily than larger ones. This is because smaller particles offer a larger surface area for oxygen to react with the sulphides.

3. Roasting Time: The duration of roasting can be adjusted to achieve the desired extent of iron oxidation. Longer roasting times can lead to more complete conversion.

4. Reactivity of the Ore: The composition of the ore itself, including the ratio of copper to iron and the presence of other impurities, can influence the roasting conditions required.

5. Sulphur Dioxide Control: In industrial processes, it's important to manage sulphur dioxide emissions as it's an environmental concern. Various technologies, such as sulphur capture systems, are used to control and capture SO₂ emissions.

6. Temperature: Higher temperatures generally favour the oxidation of sulphides to oxides and sulphur dioxide (SO₂).

In this work, sulphide copper concentrates of “Almalyk Mining and Metallurgical Combine” JSC were selected as a research material, and the oxidation process at low temperatures with the presence of normal atmospheric air was studied. Low-temperature oxidation is aimed at selective oxidation of iron in the Cu-Fe-S system. The oxidation process was carried out in a Muffle laboratory furnace. In the research work, the oxidation of iron was studied in the temperature range of 100-600 °C. The selective oxidation of iron was studied depending on the degree of separation of the oxidized material into the magnetic fraction.

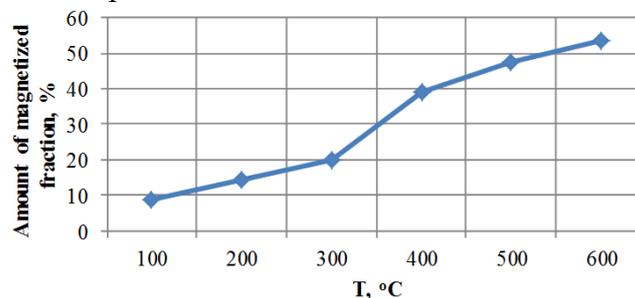


Fig.1. Changes in the amount of the magnetic fraction with increasing temperature

It can be seen from Fig.1 that when the heating temperature is up to 300 °C, the oxidized iron compounds are oxidized in a small amount, and in the temperature range from 300 to 600 °C, the level of selective oxidation of iron increased sharply. Selective oxidation in the Cu-Fe-S system cannot be achieved due to the fact that increasing the temperature above 600 °C leads to the oxidation of copper sulphides as well.

[1] A.A.Yusupkhodjayev, Sh.T.Khojiyev. *International Academy Journal Web of Scholar*, 2017, 2(11), 5 – 8.