MECHANISM OF ORE FLOTATION

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ABSTRACT

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The objective of this work was to verify partially a proposed mechanism of ore flotation. The hypothesis is that in region II of the adsorption isotherm, the flotation system yields maximum separation efficiency consequent with attaining a maximum size of aggregate formation. Hydrophobic patches on the quartz are exposed when bubbles collide with the aggregate, partially rearranges the particles. In this study, the ground quartz used had an average particle size of 28.3 μm and a specific surface area of 4.21 m^2/g. The cationic surfactant used was DTAB (dodecyltrimetylammonuim bromide) which was added to a slurry containing 50 $\pm$ 0.005 g quartz/l. DTAB concentration was prepared in the range 0.1 to 100,000 μmol/l. The pH of quartz/DTAB solutions was kept at 6.2 $\pm$ 0.05. All experiments were carried out at room temperature. For flotation, the air flow rate was varied at 5.7, 6.5 and 8.4 ml/s. It was found that flotation efficiency increased with an increase in air flow rate only up to a point. It was observed that the maximum flotation efficiency and the maximum size of quartz aggregate formation clearly coincided in region II of the adsorption isotherm, which agrees very well with the proposed hypothesis. No attempt was made in this study to determine if rearrangement of aggregate particles occur when bubble and aggregate collide.

บทคัดย่อ

พนมกร ขวาของ : การศึกษากลไกของการลอยแร่ (Mechanism of Ore Flotation) อ. ที่ปรึกษา : ศ. เจฟเฟอรี เอช ฮาร์เวล (Prof. Jeffery H. Harwell) และ ดร. สุเมธ ชวเดช 76 หน้า ISBN 974-638-492-9

วัตถุประสงค์ของการศึกษานี้ เพื่อพิสูจน์สมมติฐานกลไกการลอยแร่บางส่วน โดยสมมติฐานที่เสนอคือ ในขอบเขตที่2 ของกระบวนการดูดซับสารลดแรงตึงผิวบนผิวของอนุภาคแร่ ระบบการลอยจะให้ประสิทธิภาพการแยกอนุภาคแร่สูงที่สุด ซึ่งเป็นผลเนื่องมาจากการรวมตัวกันของอนุภาคแร่ที่มีขนาดใหญ่ที่สุด ในการศึกษานี้อนุภาคแร่ที่ใช้เป็นแร่ควอทซ์บดมีขนาดโดยเฉลี่ย 28.29 ไมโครเมตร และมีพื้นที่ผิวจำเพาะเฉลี่ย 4.207 ตารางเมตร/กรัมควอทซ์ สารลดแรงตึงผิวที่ใช้เป็นสารลดแรงตึงผิวชนิดประจุบวกคือ โดเดคซิลไตรเมทิลแอมโมเนียมโบรไมด์ หรือ ดีแทบ (DTAB) สารลดแรงตึงผิวถูกเติมเข้าไปในระบบที่มีปริมาณควอทซ์ 50 $\pm$ 0.005 กรัม/ลิตร ให้มีความเข้มข้นของสารละลายในช่วงระหว่าง 0.1 และ 100,000 ไมโครโมล/ลิตร ความเป็นกรด-ด่าง (pH) ของสารละลายถูกควบคุมคงที่ที่ 6.2 $\pm$ 0.05 การทดลองทั้งหมดดำเนินที่ที่อุณหภูมิห้อง ในการทดลองการลอยนี้ ปริมาณอากาศจะถูกควบคุมที่ 5.7, 6.5 และ 8.4 มิลลิลิตร/วินาที จากผลการทดลองพบว่าประสิทธิภาพของการลอยเพิ่มขึ้นด้วยการเพิ่มขึ้นของปริมาณอากาศที่เข้าสู่ระบบ และที่น่าสนใจอย่างยิ่งคือ ปริมาณการกำจัดควอทซ์สูงสุดและขนาดที่ใหญ่ที่สุดของอนุภาคแร่เกิดขึ้นชัดเจนที่ขอบเขตที่2 ของกระบวนการดูดซับซึ่งเป็นไปตามสมมติฐานที่เสนอไว้

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