Transporte de Masa

Termogravimetría

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Estudio de la “cinética” de procesos metalúrgicos mediante termogravimetría

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EXPRESS REGULAR ARTICI

Oxidative Sulfur Removal from Complex Copper Concentrate

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It is very important to remove sulfur from complex copper concentrates for smelting them by a carbon reduction process since copper concentrates are progressively becoming complex and low grade. The carbon reduction process largely consists of the oxidation process of complex copper concentrate and smelting process of the oxidized concentrate. In the present work, the kinetics study has been performed on a complex copper concentrate to understand the oxidation process over a temperature range of 998 to 1073 K and an oxygen partial pressure range of 15.20 to 50.66 kPa using a thermogravimetric method. It was found that the oxidation rate was very fast under the whole temperature range and almost 95% of sulfur contained in the concentrate was removed after 15 min at 1073 K under an oxygen partial pressure of 21.28 kPa. Sulfur removal ratio as a function of time has been analyzed by using a shrinking-core model and the effect of oxygen partial pressure has been elucidated. [doi:10.2320/matertrans.MER2008081]

Antecedentes

- **Debido a que la materia prima para obtener cobre son minerales cada vez más complejos y de menor ley, es útil buscar alternativas a los procesos tradicionales.**

Antecedentes

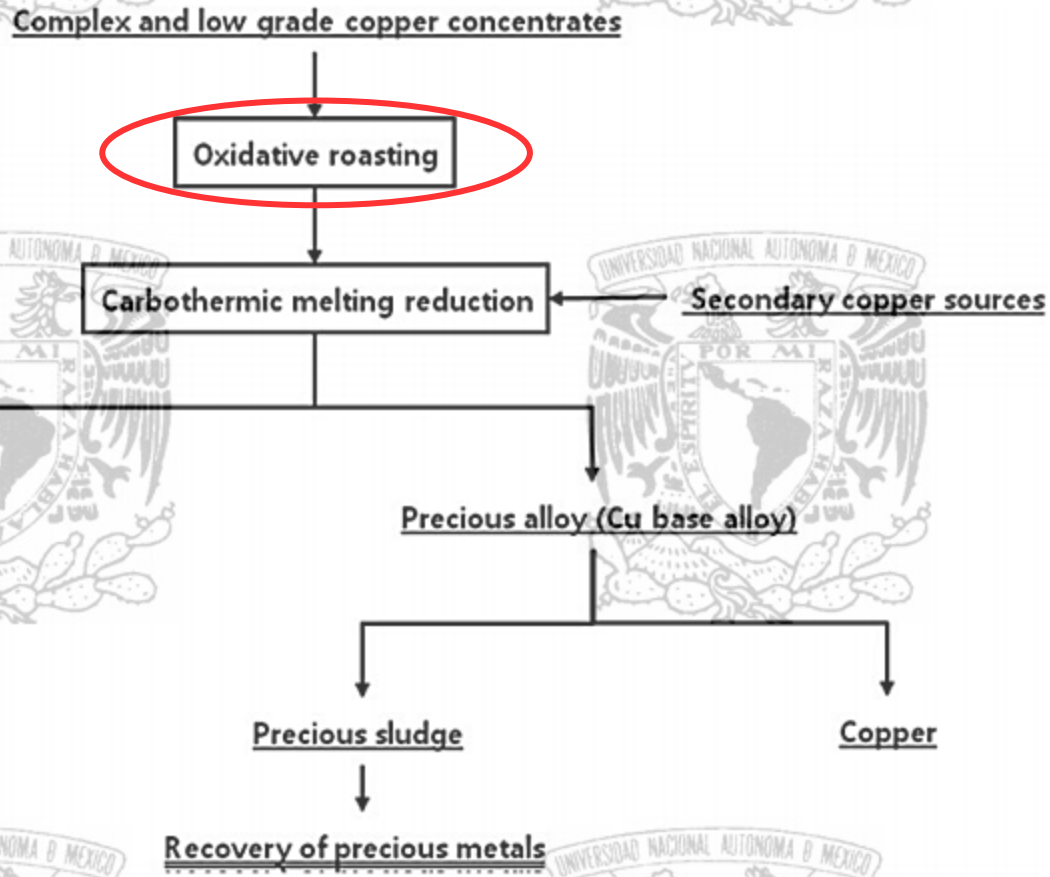

Fig. 1 Flow sheet of the carbon reduction process.

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EXPRESS REGULAR ARTICLE

Kinetics of Oxidative Roasting of Complex Copper Concentrate

Byung-Su Kim[1,*], Eun-young Kim[2], Chi-Kwon Kim[1], Hoo-In Lee[1] and Jeong-Soo Sohn[1]

Procedimiento experimental

- **Objetivo:**

  Estudiar (en el laboratorio) la rapidez de la reacción de oxidación de un concentrado complejo de cobre bajo condiciones isotérmicas.

- **Variables independientes:**
  - **Presión parcial de oxígeno**
  - **Temperatura de la reacción**

Materia prima

Table 1 Chemical composition of the natural complex copper concentrate incinerated at 873 K for 2 h under nitrogen atmosphere. (mass%)

Cu	Zn	Fe	Pb	Au	Ag	SiO_2	S
14.9	29.1	12.2	6.6	145 ppm	1045 ppm	11.5	23.8

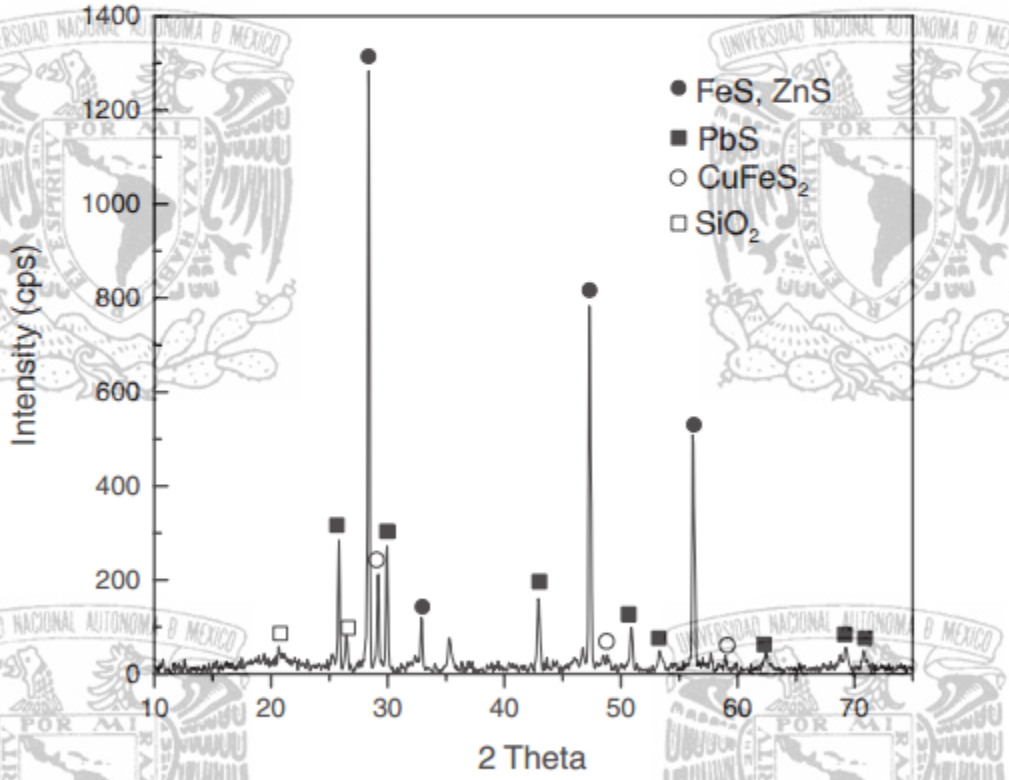

Fig. 1 XRD pattern of the complex copper concentrate incinerated at 873 K for 2 h under nitrogen atmosphere.

Equipo experimental

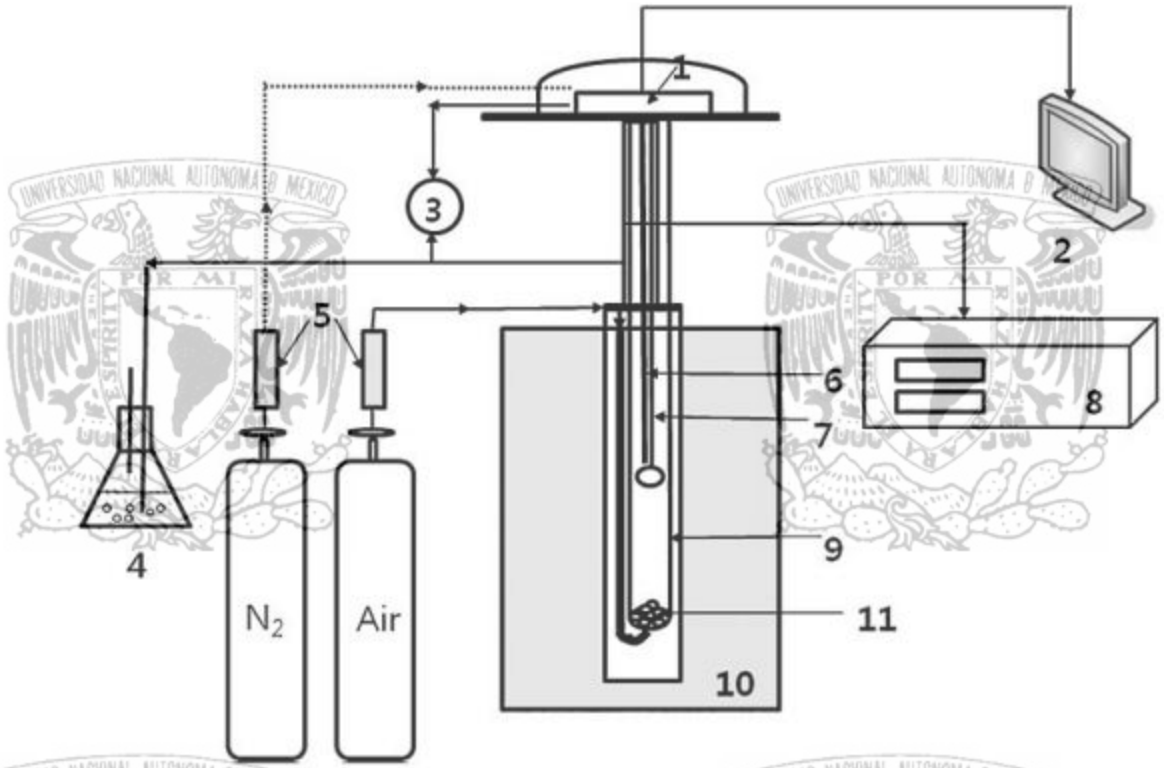

Fig. 3 Schematic diagram of the experimental apparatus for TGA thermal analysis. 1. Micro balance, 2. Data collector, 3. Pressure display, 4. Exhaust gases, 5. Mass flow controller, 6. Thermocouple, 7. Sample tray, 8. Temperature controller, 9. Reactor tube, 10. Furnace, 11. Ceramic ball.

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Productos sólidos de la reacción

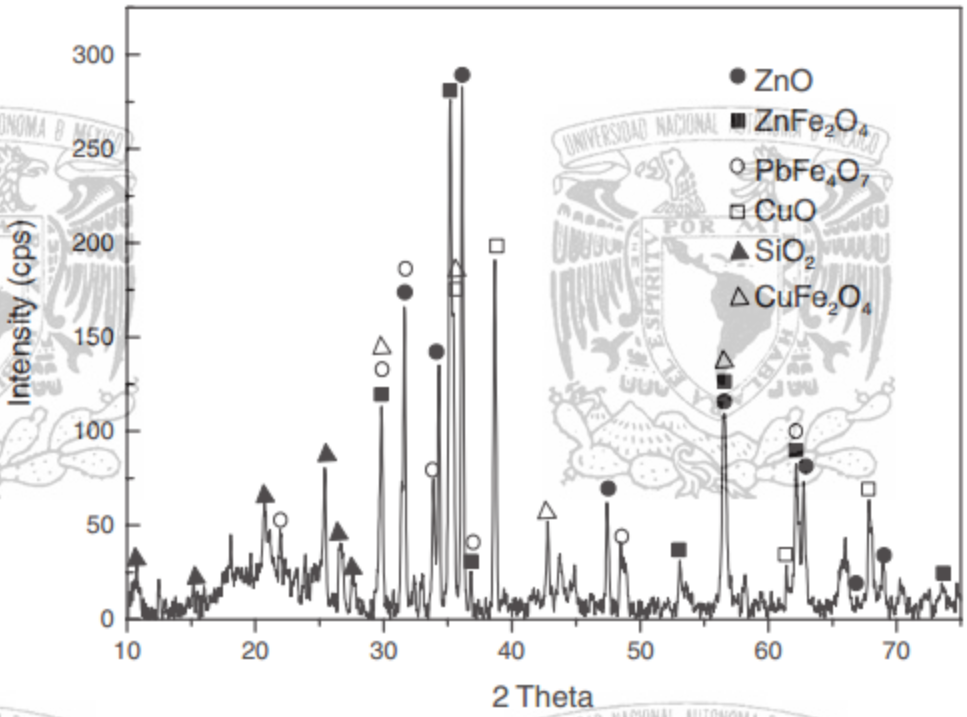

Fig. 3 XRD pattern of the product formed after the oxidation reaction at 1073 K under an oxygen partial pressure of 21.28 kPa.

Historia de pérdida de peso

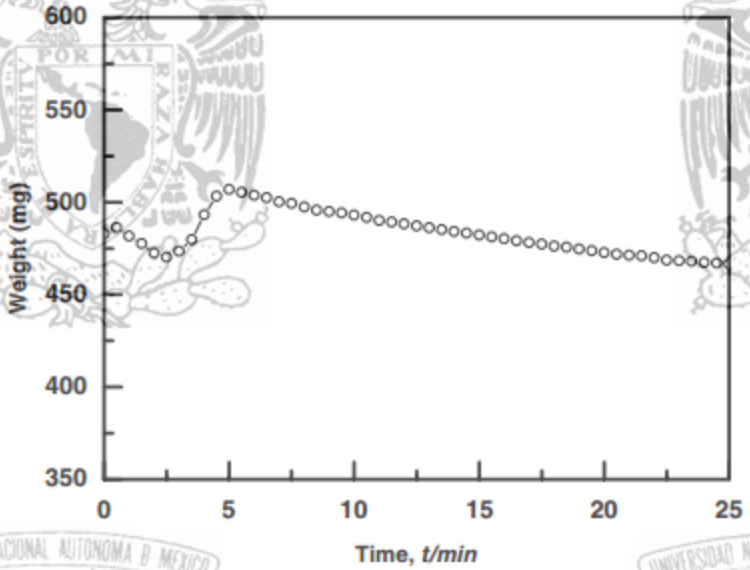

Fig. 2 A typical TGA curve of the oxidation reaction of complex copper concentrate at 1023 K under an oxygen partial pressure of 50.66 kPa.

Variable dependiente de interés

Razón de remoción de azufre: $X_t = X_F \dfrac{W_I - W_t}{W_I}$

X_t razón de remoción de azufre al tiempo t $(0 \leq X_F \leq 1)$

X_F razón de remoción de azufre total $(0 \leq X_F \leq 1)$

W_I peso inicial de la muestra [mg]

W_t peso de la muestra al tiempo t [mg]

Efecto de la temperatura

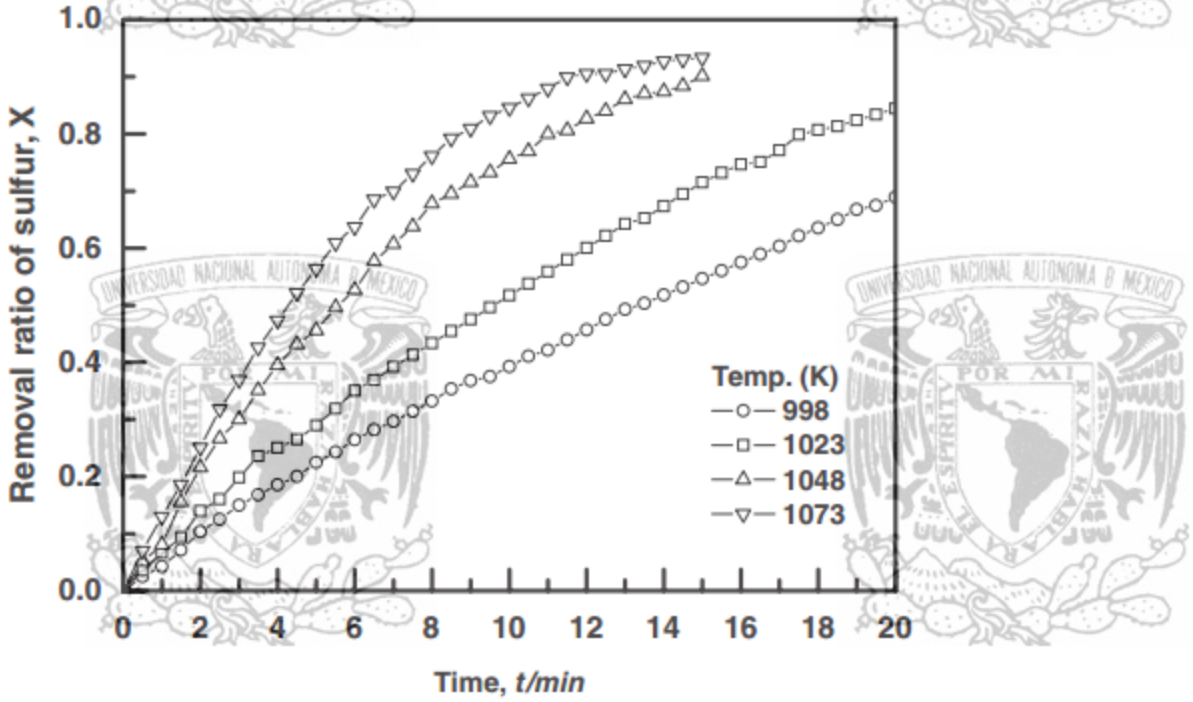

Fig. 4 Effect of reaction temperature on the oxidation reaction of complex copper concentrate at an oxygen partial pressure of 21.28 kPa.

Efecto de la presión parcial de oxígeno

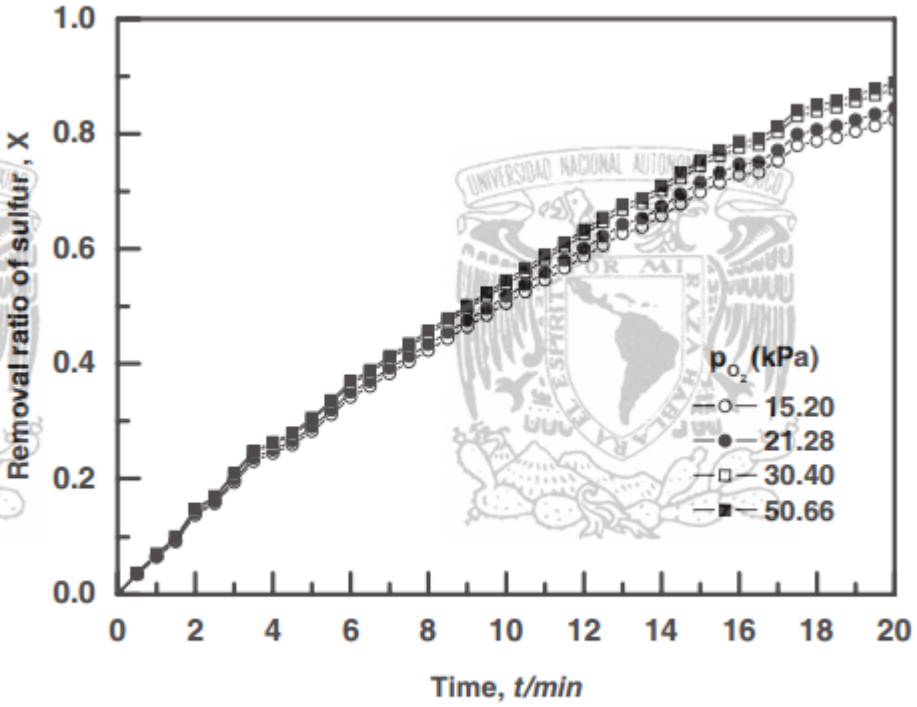

Fig. 5 Effect of oxygen partial pressure on the oxidation reaction of complex copper concentrate at 1023 K.