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(54) **METHOD FOR IMPROVING METALS RECOVERY USING HIGH TEMPERATURE LEACHING**

FOREIGN PATENT DOCUMENTS

AU AU0219785 12/1958

OTHER PUBLICATIONS

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Hackh's Chemical Dictionary, 1969, p. 317.*

Evans, et al., "International Symposium of Hydrometallurgy," Mar. 1, 1973, 2 pages.

Duyesteyn, et al., "The Escondida Process for Copper Concentrates," 1998, no month.

King, et al., "The Total Pressure Oxidation of Copper Concentrates," 1993, no month.

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King, J. A., "Autoclaing of Copper Concentrates," paper from Copper 95, vol. III: Electrorefining and Hydrometallurgy of Copper, International Conference held in Santiago, Chile, Nov. 1995.

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(52) **U.S. Cl.** **75/739; 75/740; 75/743; 75/744; 423/122; 423/658.3**

(58) **Field of Search** **75/711, 739, 740, 75/744, 743; 423/658.3, 122**

(56) **References Cited**

U.S. PATENT DOCUMENTS

| | | | |
|-----------|---|---------|------------------|
| 3,260,593 | A | 7/1966 | Zimmerley et al. |
| 3,528,784 | A | 9/1970 | Green |
| 3,637,371 | A | 1/1972 | Mackiw et al. |
| 3,656,888 | A | 4/1972 | Barry et al. |
| 3,669,651 | A | 6/1972 | Spedden et al. |
| 3,868,440 | A | 2/1975 | Lindblad et al. |
| 3,896,208 | A | 7/1975 | Dubeck et al. |
| 3,949,051 | A | 4/1976 | Pawlek et al. |
| 3,958,985 | A | 5/1976 | Anderson |
| 3,961,028 | A | 6/1976 | Parker et al. |
| 3,962,402 | A | 6/1976 | Parker et al. |
| 3,985,553 | A | 10/1976 | Kunda et al. |
| 3,991,159 | A | 11/1976 | Queneau et al. |

(List continued on next page.)

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(57) **ABSTRACT**

The present invention is directed to a process for recovering metal values from metal-bearing materials. During a reactive process, a seeding agent is introduced to provide a nucleation site for the crystallization and/or growth of solid species which otherwise tend to passivate the reactive process or otherwise encapsulate the metal value, thereby reducing the amount of desired metal values partially or completely encapsulated by such material. The seeding agent may be generated in a number of ways, including the recycling of residue or the introduction of foreign substances. Processes embodying aspects of the present invention may be beneficial for recovering a variety of metals such as copper, gold, silver, nickel, cobalt, molybdenum, zinc, rhenium, uranium, rare earth metals, and platinum group metals from any metal-bearing material, such as ores and concentrates.

15 Claims, 2 Drawing Sheets

