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Separation of indium from lead smelting hazardous dust via leaching and solvent extraction

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Highlights

- A new technique for separation and extraction of indium from LSHD was investigated.
- The optimum parameters of each procedure were obtained.
- > 99% Zn and 95% In were leached from LSHD by pressure sulfuric acid leaching.
- > 97% In was precipitated as indium-enriched residues from the 1st pressure leachate.
- > 96% In was re-leached by atmosphere sulfuric acid leaching and > 98% In was extracted by solvent extraction with D2EHPA.

ABSTRACT

A separation and extraction of indium from lead smelting hazardous dust (LSHD) was studied systematically. The novel technological keys included the pressure sulfuric acid leaching of LSHD, precipitation and enrichment of indium, atmosphere sulfuric acid leaching of indium-enriched residues and solvent extraction of indium. The optimum parameters of each procedure were obtained. More than 99% zinc and 95% indium were leached from LSHD by two-stage countercurrent pressure sulfuric acid leaching using the initial $C_{\text{H}_2\text{SO}_4}$ of the 1st stage 30-50 g/L, the initial $C_{\text{H}_2\text{SO}_4}$ of the 2nd stage 120-150 g/L, temperature 413-433 K, total pressure 0.6 - 1.0 Mpa, time 1 - 1.5 hours, L/S ratio 3-5/1 and agitation speed 400 r/min respectively. More than 97% indium was precipitated from the 1st pressure sulfuric acid leaching solution under the terminal neutralization pH 4.0, temperature 343-353 K and time 1 hour. More than 96% indium was re-leached by two-stage countercurrent atmosphere sulfuric acid leaching from the indium-enrichment residues using L/S ratio 3-5/1, temperature 363 - 368 K, agitation speed 500 r/min, time 0.75-1.5 hours, the initial $C_{\text{H}_2\text{SO}_4}$ of the first stage and the second stage atmosphere sulfuric acid leaching with 40-50 g/L and 90-110 g/L, respectively. More than 98% indium was extracted by three-stage solvent extraction using 30% (v/v) di(2-ethylhexyl)phosphoric acid (D2EHPA), phase ratio 1/6, time 1 minute and temperature 298 K.

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