OPTIMIZATION OF SELECTIVE CHLORINATION OF SPENT HYDRO-DESULPHURIZATION CATALYSTS

Fact Sheet

Project Information

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30 June 1993

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€ 0

EU contribution
€ 0

Coordinated by
FUNDACION INASMET - ASOCIACION DE INVESTIGACION METALURGICA DEL PAIS VASCO
Spain

Objective

The objective of this research project is to improve the results obtained in the previous project and to confirm them on the large laboratory scale apparatus. The chlorination of valuable elements has been chosen as the most adequate process. Research has been carried out to optimize recovery of molybdenum, cobalt and vanadium from spent catalysts, including experimentation on a large scale laboratory apparatus. The research investigated 2 methods: optimization of selective chlorination at temperatures less than 600 C so as to recover the molybdenum and vanadium compounds in the condensates and extract...
the cobalt and nickel from the residues;
optimization of selective chlorination at temperatures greater than 600 C and metals recovery of the condensates.

Data collection for engineering development, characterization of toxicity tests on the final wastes and technical assessment of the processes were undertaken. Due to engineering problems in the scale up of the high temperature process, it was decided that the low temperature approach was the more practical option.

The best results in terms of selectivity and recovery rates of valuable elements were obtained when chlorinating samples contained a reducing agent such as carbon or sulphur. Results of chlorination of raw spent catalysts were better than those obtained by the carbochlorination of roasted or carbon and sulphur free ones. The optimum conditions for the chlorination of carbon and sulphur rich samples by chlorine and air were obtained for temperatures between 400 C and 550 C with 17 to 50% chlorine in the gas mixture. Reaction duration was about 30 minutes. Optimum conditions obtained by large scale experimentation tests were within the laboratory scale optimum experimental conditions, with a temperature of 495 C and 18 to 22% chlorine in the gas mixture.

The selective chlorination process using the large scale laboratory apparatus yielded the following recovery rates for metals:
molybdenum 90 to 95%;
copper and nickel 80 to 90%;
vанадий 75%.

Comparing the chlorination with hydrometallurgical processes, the molybdenum recovery rate is similar in both, but selective chlorination allows a copper and nickel recovery rate 30% higher than using selective leaching processes.
The research will include 2 different strategies: chlorination at temperatures lower than 600 C, removing selectively molybdenum and vanadium from the residues to the condensate and concentrating cobalt and nickel in the solid phase; and chlorination at temperatures higher than 600 C in order to get all valuable metals in the condensate.

After the chlorination step the metal chloride will be separated by fractional condensation and/or hydrometallurgical processes.

This project will include the separation of the metals after chlorination and the characterization of generated wastes will also be studied. The following steps of this project will be included.
The first phase is optimization of the chlorination process and metals recovery. This will involve: optimization of the chlorination process at a temperature below 600 C; use of a large scale laboratory apparatus in order to experiment optimum conditions.
of chlorination obtained previously; and optimization of the chlorination process at a temperature more than 600 C and metals recovery.

The second phase is basic engineering involving data collection for engineering development.

The third phase is wastes characterization involving: characterization and toxicity tests on the chlorination final wastes; chemical and physicochemical characterization (scanning electron microscopy(SEM), X-ray diffraction(XRD), microprobe and chemical analysis); and toxicity tests (leaching of wastes and chemical and ecotoxicological analysis of the leachates).

The fourth phase is technical assessment of the process.

There are 4 defined milestones which determine the overall progress of this project: optimization of the selective chlorination; laboratory large scale experimentation; metal separation and waste characterization; and technical assessment of the process.

Programme(s)

Funding Scheme

Coordinator

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