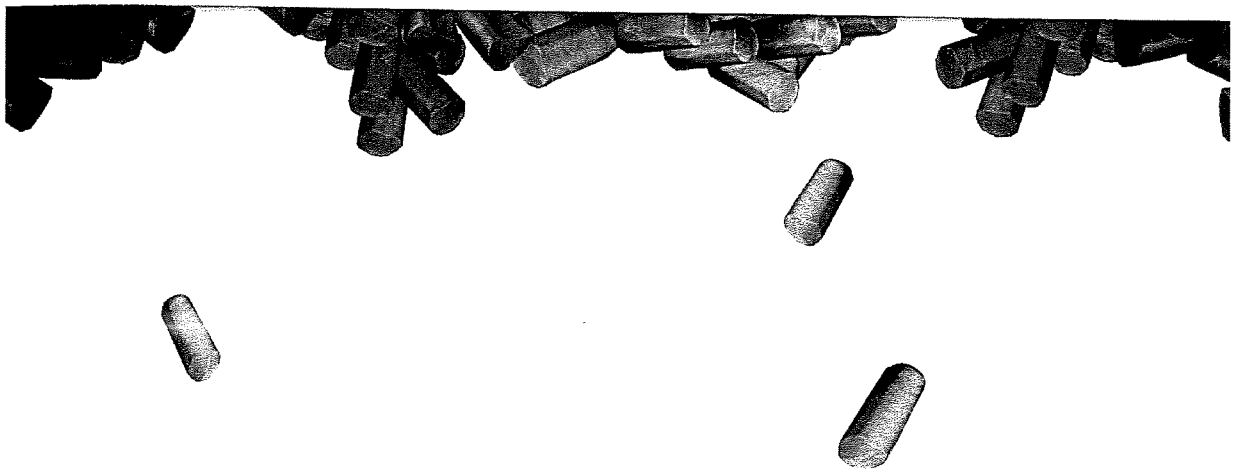

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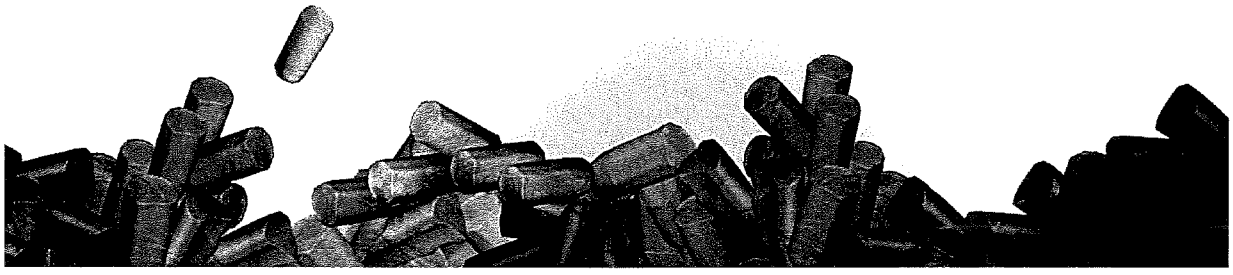

Recovery of precious metals from exhausted automotive catalysts by leaching and solvent extraction

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Platinum group metals (PGM's) are precious and rare metals used in many existing and emerging technologies such as electronics, catalysts, energy and medical appliances, among others. PGM's applications and demand are growing rapidly, and their supply is short and considered critical. Recycling of residues containing PGM's is therefore mandatory, in order to allow the continuity of supplying.

The main market share of PGM´s are catalysts, specially automotive catalytic converters. When exhausted, these wastes constitute important secondary resources that cannot be neglected. Therefore, the recycling of autocatalysts has been taken growing attention. Although some refiners operating plants for PGM's recovery from residues are already known, the processes are complex, involve many operations and are highly reagent-consuming. Research in this domain is increasing, trying to develop new technologies and processes, more efficient and selective, and less consuming. Hydrometallurgy, and specifically solvent extraction with new reagents, can play an important role in achieving those objectives.

In this context, a research has been carried out aiming at developing hydrometallurgical technologies to recover PGM's from spent autocatalysts. This paper presents some results of this investigation, namely concerning the leaching and solvent extraction operations. A Pd-Rh bearing catalyst was mechanically treated by shredding with a cutting mill, allowing size reduction to average particle size of d50=0.61 mm. The leaching operation was tested using hydrochloric acid media (6 M) and several concentrations of nitric acid as oxidizer (0.5-2.4 M). The results attained showed that the dissolution of Pd and Rh was very efficient, with yields near 90%, whatever the nitric acid concentration used.

The extraction and separation of PGM's from synthetic aqueous solutions was studied with amide extractants, namely an N,N'-tetraalkyl substituted thiodiglycolamide. The results showed a good selectively of this extractant for palladium against rhodium, allowing 100% Pd extraction in a wide range of HCl concentrations (1-8 M), while Rh extraction was near 65%. The complete selectivity can be however attained in the subsequent stripping operations, given that Pd can be quantitatively stripped with thiourea/HCl solutions while Rh co-extracted is only stripped by a soda solution. Platinum, if present in the catalysts, can also be processed by this extractive system, since it is also extracted mainly for high HCl concentrations in leachates, and can be selectively stripped by diluted HCl solutions. The achieved results seem promising for developing a new process for efficient separation and recovery of PGM's from catalysts, using acid leaching and highly selective solvent extraction technology.