

Better understanding of Rare-Earth Metals (REM) recovery from ashes

Recometal Sp. z o.o. is a R&D company, which develops metal processing technologies to lower material and energy consumption. The company's current projects are focused on two major topics: precious metals recycling and energy consumption improvement of hydrometallurgical processes. The company's focus is on toxic waste management and its main goal is to lower concentration of toxic substances and afterwards recovery of precious metals, according to "zero waste" philosophy. Additionally, the technologies developed by the company are profitable for other hydrometallurgical processes improving their material and energy effectiveness and lowering waste production.



The industrial need

The company wanted to understand the probability and profitability of Rare-Earth Metals (REM) recovery from ashes. The main technological need for research project was determination of chemical compounds which consist of REM in coal ash. The knowledge of chemical compounds consisting of REM would be crucial for estimation of possibility and profitability of REM recovery. The cost estimation of REM recovery from coal ash would enable the company to proceed with further investment in REM recovery technology.

Experiment

In order to address the industrial challenge, several experimental methods were proposed for testing. One of the most responsive was the X-ray diffraction which identified primary, secondary and tertiary phases in the investigated ash. One of the main phases contained REM. The photoelectron spectroscopy was eliminated due to low conductivity of material and problem to compact the ash. The content of REM was too low to use the X-ray absorption spectroscopy. During the experiment the company was actively participating in decision making and expressed the need to try to condense the phase which could contain REM according to results of X-ray diffraction studies.

Findings and steps ahead

The performed experiment indicated the most probable phase which may contain REM, thereby responding to the question addressed by the company. After condensation of the fraction of ash with the REM content, the X-ray absorption spectroscopy was recommended to estimate more precisely the chemical binding of REM. The experiment was performed on ash, and this finding eliminated several analytical techniques which need high vacuum and sample conductivity (e.g. XPS or SEM). The performed diffraction studies indicated that after coal burning several crystalline phases are present in ash. The chemical content of ash presumably depends on the geological condition in place where coal was formed.

The study findings helped to determine important parameters and enabled further research, including a laboratory scale REM recovery process test, which proved possibility to recover REM from coal ash. Next step would be to develop a cost-effective industrial scale process.

Additional information

The REM-case was processed and monitored by the Institute of Physics Polish Academy of Sciences and the Foundation of Innovative Initiatives (FII) acting as Industrial Research Center under the Baltic TRAM project. In general, the performed measurements and the received findings contributed to the development of the chemical sector, being one of the most promising and important in the Mazowieckie Region in Poland.

Contact

The Foundation of Innovative Initiatives
Cegielniana 4a
30-404 Krakow, Poland
tel. +48 12 3505752
e-mail: biuro@fii.org.pl
website: www.fii.org.pl

For more information visit www.baltic-tram.eu

