Poster | Raw materials

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[P2] Raw Materials & Recycling

Session Chair: Mr. Johann Fischbacher (University for Continuing Education Krems, Austria), Dr. Yusuke Hirayama (AIST, Japan)

[P2-34] Nitric acid technology for processing magnetic production waste

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UrFU is developing a technology for recycling waste from the production of permanent magnets based on the use of nitric acid solutions. The choice of the scheme is dictated by the possible placement of the future site at an existing production facility, where nitric acid is already used in the technological process, and there is all the necessary infrastructure for the placement of such media, their regeneration and disposal.In order to minimize the environmental impact and prevent the formation of additional secondary waste at the primary stage of processing part of the products - grinding waste, it is proposed to use a unit for the regeneration of solvents and cooling liquids. Regeneration of these products will be carried out at a distillation-type unit. Boiling of the contaminated solvent will occur in a tank with a shell and a mixing device filled with diathermic oil, which will be heated by an electric resistor. The resulting vapors will pass through a condenser cooled by water, passing into the liquid phase. The solvent purified in this way will be collected in appropriate tanks and subjected to subsequent separation/use.The unit for nitric acid dissolution of waste from the production of permanent magnets implements the principle of continuous selective transfer of iron from the leaching solution to the oxide phase.
In order to eliminate additional costs for the disposal/placement of the leaching solution after extracting the REE concentrate and iron concentrate from it, a nitric acid regeneration unit is proposed.
The operation of this unit will allow for the simultaneous production of crystalline boric acid with a yield of at least 70%. The still bottoms formed in the nitric acid regeneration unit contain about 1% free nitric acid, as well as nitrates of alkali, alkaline earth and non-ferrous metals with a content of about 1%. It is advisable to process or place this still bottoms at the facilities of the existing enterprise.Direct costs for nitric acid regeneration will be determined by electricity costs and will be about 300 kW/hour. The cost of electricity costs will be 10% of the cost of nitric acid. Thus, the use of a nitric acid regeneration unit in the implementation of this process seems to be the only alternative.
Based on the conducted studies, it was established that the current level of technology for processing spent magnets and magnetic production waste, including "dry" and "water" technologies, is not always applicable in industrial production of REE. It is necessary to develop new technological approaches that, on the one hand, would be economically justified, and on the other, meet the requirements for reducing the environmental burden.