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NEW TECHNOLOGIES OF PROCESSING OF SECONDARY RAREMETAL RAW MATERIAL

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The review of new publications concerning production volumes, application areas, technologies of processing for secondary raw materials of rare metals of three groups: refractory rare, scattered and light rare metals are made.

Keywords: secondary raw materials, scrap, rare metals, production volume, application area, technology of processing

High-heat rare metals. Worked out molybdenumcontaining catalysts (WMC) come into to itself a notice as secondary raw material for recovery of molybdenum. Optimal conditions of lixiviating of WMC of hydrocleaning by solution Na_2CO_3, on results of work [2], given: temperature 85-100 °C, concentration of carbonate sodium solution 5-10 %, S : L = 1 : 10, duration 60-90 min. Thus recovery of molybdenum oxide (VI) in solution is 75-85 %. From solution Na_2MoO_4 molybdenum can be recoveries as on sorptive technology on anion-exchange resins so direct deposition from solution in composition the calcium molybdate. For recovery of molybdenum from WMC of cracking of oil it can be applied biolixiviating [2].

As an optimal mode of processing of exhaust vanadiumcontaining catalysts in work [3] indicated: lixiviation by oxalic acid 2 % concentration at S : L = 1 : 25, duration 4 hours and temperature 50 °C, largeness of material of 180-250 мкм.

Niobium of high-purity is got by the cathode-ray melting of draft alloy, appearing at alumo- or alumocalcium renewal of pentaoxide niobium.

At the making of pentaoxide tantalum from wastes of its production use hydrometallurgical part of technological chart, which foresees dissolution of feed stock, its recovery cleaning, deposition and tempering.

On «Titan at International conference - 2014 in the CIS» [4] it was established that powers on the production of spongy titan in countries the CIS in a period from 2006 to 2013 steadily grew and exceeded 45 thousands of t in Russian Federation, 25 thousands of t - in Kazakhstan and 10 thousands of t - in Ukraine.

In work [5] zirconium of nuclear cleanness is got from scrap of working shells (alloy *Zr*-1*Nb*-1*Sn*-0.1*Fe*) by the method of electrolytic affinage in fusion *LiF-KF-*ZrF_4.

Wastes of production of iodide zirconium are used in work [6] as a feedstock for the making of high-clean zirconium by the method of iodide affinage.

Scattered rare metals. In work [7] worked out and mastered pilot-scale hydrometallurgical technology of processing of wastes of phosphide and arsenide.

For making of liquid-crystal displays (LCD) materials there are widely used on the basis of ITO (oxides of indium and tin). There is a problem at separate selection of tin and indium at processing of displays scrap. In work [8] it is shown that from chloride or sulfate solutions it is possible selective to deposition tin and indium by means of adjusting of pH.

In work [9] the process of the cementation deposition of indium powder is studied by aluminium. As optimal the process of cementation at the temperature 60 °C during 10 min is offered

In a patent [10] the construction of electrolyzer is offered for recovery of indium from indiumcontaining fusion as a condensate from a vacuum furnace.

The basic types of secondary raw material of rhenium are wastes of its alloys and exhaust *Al-Pt-Re* catalysts (APRC). In Czech Republic [33] processing of wastes of superalloys of CMSX-4 and CMSX-10 is produced and cleaning of primary perrhenate of ammonium (PNA), purchase in Central Asia.

Easy rare metals. Presently lithium-ion accumulators are the basic type of energy supply of electric cars

In work [11] four types of sorbents are tested for recovery of lithium from solutions, appearing at processing of exhaust lithium-ion accumulators of electric cars. Method of selection of lithium and cobalt in solution through a dialysis with a bipolar membrane, united with helation, in recycle lithium-ion batteries worked out in work [12].

Except for traditional application of beryllium in metallurgy as copper-beryllium and alumo-beryllium ligatures presently, another (unique) sphere – liner of the first wall of a vacuum chamber of international thermonuclear experimental reactor of ITER, which is built in France [12]. For liner the plates of beryllium will be used from three producers: to the USA, PEOPLES Republic of China and Russian Federation. Maker of initial ingots of beryllium serves Kazakhstan AS «UMP».

The method of processing of wastes of metallic beryllium and special ceramics on the basis of beryllium dioxide with the making of connections of beryllium of high-purity is offered in a patent [13].

Conclusion. For processing of secondary rare metal raw material there are use both hydrometallurgical (lixiviating and bioleaching, chemical deposition, cementation, recovery, ionic exchange, electrolysis and electrodialysis, rectification) and pyrometallurgical (burning, thermal decomposition, high-temperature renewal, melting) technologies, allowing selective or collectively to recovery rare metals as chemical compounds or elementary kind.

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