UDC 669.292(477)

V.S. Igmat′ev, professor, c.t.s.
G.N. Tregubemko, professor, d.t.s.
G.A. Polyakov, senior teacher
S.A. Ventskovsky, undergraduate
D.V. Leleko, graduate student

BASIC TENDENCIES OF PERFECTION FOR TECHNOLOGIES OF PROCESSING AND AFFINAGE OF SECONDARY LEAD

National metallurgical academy of Ukraine, Dnepropetrovsk

With the development of the automotive industry the quantity of waste acid batteries, which serve a source of lead increases. The ecological aspects and ways to improve the recycling of secondary lead raw materials used by foreign enterprises are considered. It has been established that the technological scheme and the mounting of apparatus depend on the type and chemical composition of the lead raw materials.

Keywords: battery scrap, secondary lead, recycling, technology of treatment, ecology

Presently by a basic application of lead sphere are chemical sources of current. A leading place among it's occupied by storage leaden batteries, an about 70 % production of lead is on producing of acid accumulators [1]. At the sphere of collection and processing of crow-bar there was a necessity of making alteration, constrained and with ecological safety. A potential chemical danger consists in that an about 60 % mass of standard accumulator makes plumbiferous material. As an electrolyte aggressive sulphuric acid is also used [2].

Processing of servings out accumulator batteries of different type allows organizing recycling of secondary lead. In the economic developed countries (Japan, USA, South Korea) the degree of processing of storage-battery crow-bar arrives at 95-98 %. As a rule, got after processing of crow-bar, secondary lead is sent further to the production of new accumulators. It allows to carry out recycling of not only lead but also row of other metals in composition an alloy (antimony, copper, tin and arsenic). In work [3] methods over of lead affinage and it cleaning for the further using at creation of chemical sources of current are brought.

The bulk of secondary lead is got as a result of processing of crow-bar in mine, reflecting, electric and rotor short-barrel-type furnaces.

In work [4] ecologically safe technology of processing for plumbiferous crow-bar is considered. A scheme plugs in itself the cutting of exhaust storage batteries, melting and affinage of load bullion and receipt of trade products. Melting is conducted in an electro-thermal furnace on technology worked out in the institute of «Giprotsvetmet» (Russian Federation) in which does not apply a soda as fluxing addition.

One of perspective methods of processing of plumbiferous crow-bar is extraction of lead in a powder-like form from exhaust accumulators. In work [5] the process of receipt of ultra small powder of lead with faction of 0.1-0.5 mcm is offered from plumbiferous paste of accumulators. Paste passes the stage of desulphurizing with the

use of connections of Na_2CO_3, $NaHCO_3$ or $(NH_4)CO_3$. Further the stage of treatment by lemon acid and glowing at a temperature 370 °C with the receipt of small fractional oxide of lead. This process is simple in realization, ecologically clean and effective.

The processes of processing of leaden crow-bar by the methods of electrometallurgy and hydrometallurgy are related with formation of plenty of slag and chloride dust. In this connection in work [6] the process of extraction of lead from the slag of the used leaden-acid batteries is described. A slag contains an about 60 % iron and 6 % lead.

Technology of processing of chloride of plumbiferous dust is described in work [7]. As results of experiments showed, the process of processing is completed at a temperature 1100-1200 °C during 30 minutes. Thus the degree of extraction of lead arrives 98 %, and about 96 % chlorine is transferred in salt fusion.

A storage-battery crow-bar can be also processed by the methods of hydrometallurgy. In work [8] the method of extraction of cadmium from nickel-cadmium accumulators with the use of complex reagent which provides extraction of metal and is economic safe material is presented. The conditions of receipt of connections of iron and cadmium, which provide the selective and practically complete division of admixtures and cadmium, are certain in work. A technical scheme is ecologically clean, eliminates it toxic connections in an environment. As a result of the experienced tests parties of hydroxide of cadmium $Cd(OH)_2$ are got, which passed tests on LTD «The Kursk storage-battery plant» (Russian Federation).

One of environmentally clean methods of utilization of lead is dissolution of leaden plastins in an electrolyte and electrolytic receipting of lead. A method can be applied and for exhaust accumulators. An electrolyte maleness acid serves as. As a result of treatment complete utilization of lead from exhaust storage batteries is arrived [9].

In work [10] a process which behaves to the hydrometallurgy and allows to obtain extraction of lead from paste of leaden-acid accumulators is considered. Except for metallic plastins, in an accumulator there is another plumbiferous raw material - leaden paste, which consists of connections of $PbSO_4$, PbO_2 and $PbSO_4$. As a solvent an acetous carbamide is used. Speed of deposition of lead from solution depends on the size of surface of bottom layer. This process has a row of advantages, basic from which, is an ecological cleanness, as compared with the classic pyrometallurgical processing of storage-battery crow-bar in the revolved furnaces.

In the sphere of affinage for board lead it is expedient to use more «soft» standards and norms in relation to maintenance in lead after treatment of such admixtures as silver and bismuth (because they are difficult recovered) for example of «soft» lead with content of antimony to 0.005 %. In behalf on it regulation of content of admixtures testifies in leaden powder which is raw material for treatment of plastins of accumulators. In Ukraine it is expedient to produce «soft» lead which contains basic admixtures like the norms accepted in EC.

Conclusions. In modern industry the sphere of processing of plumbiferous crow-bar develops actively. In spite on presence of plenty of technologies, related both to the pyrometallurgy and to the hydrometallurgy, it is necessary to continue re-

search for achievement of greater ecofriendlyness of process. To date, due to development of motor-car industry, the quantity of exhaust storage batteries grows constantly, that specifies on the necessity of sparing of the special attention to technologies of recycling lead and introduction of its for a production.

LIST OF LITERATURE

1. Кириченко, А. С. Переработка аккумуляторов. Зарубежный и отечественный опыт [Текст] / А. С. Кириченко // Вторичные металлы. – 2010. – № 6. – С. 56-58.
2. Сорокина, В. С. К вопросу о переработке свинцовых аккумуляторов [Текст] / В. С. Сорокина, А. Д Бессер / Цветная металлургия. – 2003. – № 2. – С. 28-36.
3. Сорокина, В. С. Анализ технологий рафинирования вторичного чернового свинца [Текст] / В. С. Сорокина, А. Д. Бессер, В. М. Парецкий // Электрометаллургия. – 2010. – № 7. – С. 34-41.
4. Тарасов, А. В. Экологически безопасная технология переработки вторичного свинца [Текст] / А. В. Тарасов, А. Д. Бессер // Цветная металлургия. – 2011. – № 7-8. – С. 70-75.
5. Xinfeng, Zhu. Preparation of basic lead oxide from spent lead acid battery paste via chemical conversion [Text] / Zhu Xinfeng, Li Lei, Sun Xiaojuan // Hydrometallurgy. – 2012. – № 117-118. – С. 24-31.
6. Qualitative lead extraction from recycled lead - acid batteries slag [Text] / A. Smaniotto, A. Antune, F. I. Nascimento, V.L. Domelles // Hazardous Mater. – 2009. – № 2-3. – С. 1677-1680.
7. Игнатьев, В. С. Физико-химические исследования пирометаллургической переработки свинцовой хлоридной пыли [Текст] / В. С. Игнатьев, Е. С. Коротеев // Металургія : наукові праці Запорізької державної інженерної академіі – Запоріжжя : РВВ ЗДІА. – 2008. – Вип. 17. – С. 38-41.
8. Барашеев, А. Р. Гидрометаллургическая переработка аккумуляторного crow-bara с использованием комплексообразующего реагента [Текст] : автореф. дис. канд. техн. наук : / А. Р. Барашеев ; [Уральский федеральный университет]. – Екатеринбург, 2011. – 20 с.
9. Сорокина, В. С. К вопросу о переработке свинцовых полупродуктов [Текст] / В. С. Сорокина, А. Д. Бессер // Цветная металлургия. - 2009. - № 2. - С.29-36.
10. Способ утлизации свинца [Текст] : пат. 2353685 Рос. Федерация: МПК7 С 22 В 13/00 (2006.01), С 22 В 7/00 (2006.01), С 25 С 1/18 (2006.01) / Гасанова Ф. Г., Алиев З. М. - № 2007137290/02; заявл. 08.10.2007; опубл 27.04.2009.