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Plating Plant Waste Utilization in Glasswork, Ceramic and Building Industry

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ABSTRACT

The technology allows using electroplating plant waste for recovery of fine inorganic pigments, which may be used in paintwork and ceramic industry (for coating and enamel preparation, for ceramic painting), in glasswork (colored glass) and in building industry (for producing foundation slabs, sidewalk plates and curbing, for art urban planning, for pavement and aerodrome covering and so on). For fine inorganic pigment recovery so-called sol-gel method was used.

Key Words: Electroplating Wastes/Fine Inorganic Pigments/Waste Utilization

The problem of regeneration, waste neutralisation and utiluzation of the spent electrolytes, wash waters and electroplating sludges is very important for ecology and usage of recoverable resources.

On the one hand, wastes of such electrochemical procedures as chromizing, nickelizing, zincing, cadmium and copper plating, polishing, are high-toxic. During storage of the wastes, heavy metal compounds permeate into soil and underground water, making significant hazard to Environment.

On the other hand, recovery of non-ferrous and rare-earth metals from electroplating wastes is possible due of well-proven technology of metal recovery from ores. The technology allows receiving different kinds of production with high level of cleanness, and, as content of the non-ferrous and rare-earth metals in the solid electroplating wastes is more higher than their content in the raw material, so their recovery from the sludge should be profitable.

In German, Japan, USA and some others countries this issue has already found practical solution, there are some suggestions with different approaches (kinds of the techniquies) in Russia too, but some factors , such as lack of centralized collectors, apartness and dispersion of the electroplating plants, diversity of electroplating waste content, shortage of normative documentation for financial and legal relations between supplying plant of the wastes and processing plant, make the problem of the metal recovering from electroplating wastes intractable.

Together with the technologies of electroplating waste treatment with purpose of receiving valuable elements there are some interesting techniquies, that not required a lot of investments and

power charges and where electroplating sludges are used as raw material for receiving industrial products. For example, electroplating wastes, received after chromizing, are presented by comparatively pure chrome hydrooxide with small additions of Ca and Na, and may be used as a base for development such valuable product as chrome carbide; polishing wastes, containing 95% aluminuim hydrooxide with little additions of non-ferrous metals, may be used as additives in ceramic industry and in refractory production. There are others areas of electroplating waste applications as raw material: in metal manufacture, in production of polishing pastes, and so on.

Especially wide the electroplating wastes may be used in ceramic, glass and building industries:

products, ferritizing (for deeper passivation of the toxic agents), vitrification and so on; or during the immobilization for mixing with wastes and additives, namely as filler and as plasticizer in mortar, concrete and so on.

The suggested technology envisages electroplating waste utilization with purpose of receiving fine inorganic pigments, that may be widely used in paintwork and ceramic industry (for coating and enamel production, for ceramic paintings), in glasswork (colored glass production) and in building industry (for producing foundation slabs, sidewalk plates and curbing, for urban planning, for pavement and aerodrome covering and so on).

For fine inorganic pigment production so-called sol-gel method was used. It means input of aqueous-soluble resolved organic compounds, which aid to constant gel generation, into water solutions of inorganic salt or hydroxides (suspensions) of nonferrous metals, following heat treatment with temperature 120-150°C and, afterwards, calcination with temperature 1000-1200 °C until metal oxide formation. As initial water solution etchants, spent electrolytes, solutions after galvanic pulp opening or their suspension may be used.

Developed sol-gel method of receiving inorganic pigment powder compares favourably with traditional one by excepting such hazard and energy-intensive stage as grinding. Size or the received particles is less 1 mkm, this is in order less, than after grinding. Consequently, hiding property will increased noticeably.

From different electroplating wastes inorganic pigments of various colors (white, black, grey, different shades of blue, green, brown and yellow) were received. The pigments were tested at glass ceramic production for microelectronics, colored glaze and paints for studio pottery.

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