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The results of the electrochemical clearning of drainage waters

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There is a problem of industrial drains clearing in various branches, but especially sharply in a metal manufacture that is caused by great volumes of the wastewater containing high residual concentration of heavy metals. It is necessary to pay attention to solids in wastes. In a long-term interaction with oxygen of air and natural deposits the acid drainage is often formed and takes out a number of elements with different classes of toxicity to superficial and underground waters. Therefore search of an extraction possibilities for toxic components for a eliminate of their further migration is the big deal.
Belov Zink Plant located in the Kemerovo region. During sixty years the factory stably made up to 10 000 tons of zinc annually and in passing up to 30 000 tons H2SO4 processing a blende concentrate. Now the factory has stopped the activity, however, in territory have remained uncontrolledly stored about one million tons of the wastes, presented by slags and ashes. Visually clinker represent coarse-grained sands of the typical slag containing 0.7-15% Zn, 0.3-8.5% Cu, 0.03-0.7% Pb and 2-400 g/t Cd. Besides in tailings the sub-standard sulfuric acid [Bortnikova, etc., 2006] are merged. Acid (=3.5) and highsaline waters of a drainage stream with significant concentration sulfate-ion (up to 20 g/l), copper (up to 6 g/l) and zinc (up to 4 g/l), that allows to consider as macrocomponents. A wide number of microcells in drains exceeds maximum concentration limit (MPC) of chemical substances in objects of drinking and community use. The basic chemical forms of present metals (Al, Mn, Zn, Fe, Co, Ni, Pb, Cu) are aquo-ions and sulphatic complexes.
Earlier in our laboratory searching of a way of a toxic components concentration downturn in drains of Belov plant - sorptive clearing by natural clays [Gaskova, Kabannik, 2009] and sedimentation of toxic elements on carbonate barrier [Yurkevich, etc., 2008] were done, however the desirable result by virtue of that this object represents very difficult chemical system not received. In this work the experimental researches on clearing acid drainage waters of the Belov Zink Plant from a lot of toxic elements during electrochemical with the active Al anode are resulted.
For achievement of an object in view following experiment has been conducted. To a drainage solution in volume of 100 ml have added an aluminium foil (0,3 g weight). In an electrochemical line of activity Al stands more to the left of considered metals: K, Ca, Na, Mg, Al, Mn, Zn, Fe, Co, Ni, Pb, H, Cu, Ag, Pt, Au, i.e. possesses more negative potential. At interaction of metal aluminium with a solution, containing salt metals with less negative potential than aluminium, there will be a transition electones from aluminium to +. Thus, there will be restoration + and oxidation of aluminium:
n+ + n ē → Me0, Al0 – 3ē→ Al3+.
In seven day of experiment it is revealed, that the is bright-blue drainage solution has become colourless (=3.9), the plate was dissolved approximately half, at the bottom of a glass powder copper (0.5 g) has dropped out in a deposit. Owing to that Al-hydroxide start to drop out at a solution> 4, we could separate free filtering powder copper from a solution. At a following stage of experiment have besieged Al-hydroxide by means of neutralization of a solution by ammonia up to 7.5. Dropped out white flakes have separated from a solution by filtering.
By results of experiment (a method of analysis ISP-IES), that after interaction with an aluminium foil in a solution there were 10 mg/l Cu and Pb <0.05 mg/l, concentration of other metals have remained at the same level. It is possible to explain it to that copper and lead possess the greatest difference of potentials with aluminium. After neutralization at the second stage of experiment concentration of Al became at level MPC. Owing to co-precipitation on Al-hydroxide the amount of toxic elements Be, Se became comparable with MPC; for Fe, Cu - it is less MPC. In a solution there were 6% Zn, o - 20%, Ni - 60%, Mn - 77%, from initial concentration. Besides on we receive powder copper and Al-hydroxide which are used for manufacture coagulants and fire-retardants in the industry.
The received results allow to speak that the offered way of clearing of a drainage solution with the addition of

metal aluminium with the further neutralization enables substantially to lower acid drainage and flow of some toxic elements of different classes of danger and to leveling up to natural.