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# Properties of materials for advanced technology of joint utilization of man-made waste

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**Abstract**

With the aim of improving the technology of co-processing of red mud (RM) and oily mill scale free (OMS) using co-temporal methods and apparatus, including using equipment of the center «Ural-M», studied the physico-chemical properties of industrial wastes.

The main components of RM are: Fe (35.7%) in the form of hematite and complex hydroalumination, Ca (11.0%) in the form of calcite and hydro-aluminosilicates, Al (6.8%) and Si (4.7%) in the composition of hydroalumination, Na (2.8%) in the form of hydroalumination, carbonate and hydroxide, Ti (2.5%) in the form of rutile. The sludge moisture content was 11.9%. The main components of the OMS are: Fe (71%) in the form of magnetite, wustite and hematite with a very small amount of fayalite. The contents of Si (in the form of quartz), Al and P (non-forming phases) are within 1-3%. Humidity OMS – 16.3%, the content of indelible organic matter – 4.0%.

Granulometric composition of RM is characterized by high dispersion. With an average diameter of 1.6 μm, all particle sizes are in the range of 0.5-12 μm. Granulometric composition of OMS is characterized by complexity. With an average diameter of 8.6 μm, maxima of 0.9 μm and 15 μm and a minimum of about 1.2 μm are observed in the particle size distribution. The specific surface area of the materials is equal to RM 23.7 $m^2/g$, and OMS – 1.9 $m^2/g$.

The change of waste properties after exposure to aqueous solutions of alkalis and acids neutralizing the effect of organic (OMS) and alkaline (RM) surface compounds was studied. Neutralization of aqueous suspension with HCl solution leads to removal of alkaline film from the surface. As a result of the impact of reagents, there is a decrease in the content of water-soluble components in the processing products. At the same time, the average particle sizes of RM and OMS increase to 2 and 14 μm, respectively, and the specific surface area to 25.7 and 2.3 $m^2/g$. The distribution of particle size of RM is almost constant, and the OMS is approximately 5 and 10% of the smoothed maximum and minimum in the area of at least 0.5 and 15 μm.

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