New Direction for Waste Activated Sludge Disposal (WAS)

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The processing of large-scale waste activated sludge is based on the WAS carbonization process and the participation of the formed reactive carbon in the reduction of metal oxides. The process of carbothermal reduction of Fe_2O_3 as an example is considered. The studies have shown that during the temperature treatment of mixtures x% Fe_2O_3 - y% WAS under conditions of oxygen deficiency in a gaseous medium, the standard reduction process successfully proceeds: α-Fe_2O_3 → Fe_3O_4 → FeO → Fe (amorphous phase). Depending on the ratio of the WAS: Fe_2O_3 components and the temperature-time conditions of mixture treatment, it is possible to establish the modes of predominant formation of various stages of Fe_2O_3 reduction, and, accordingly, indicate promising areas of their application. Therefore, on the basis of heat-treated mixtures WAS: Fe_2O_3, it is possible to obtain heating elements, the heating temperature of which varies from ~ 100 ^oC to ~ 600 ^oC. High temperature treatment (~ 1000 ^oC) of compacted dry mixes allows simple 3D-synthesis of amorphous iron. Treatment of mixtures in the range of 800-900 ^oC leads to the formation of ferromagnets. Low temperature treatment of mixtures (600-700 oC) can be used to obtain composite (C-Fe_2O_3/ Fe_3O_4) adsorbents.

The primary studies carried out indicated the prospects of using WAS as a source of the formation of carbonizate and the participation of the latter in the reduction processes of oxides of both metals and non-metals.

Key words: WAS, Fe_2O_3, carbonizate, reduction