Development of Heating Elements Based on Fe₂O₃ Reduction Products by Waste Active Sludge

Authors : Abigail Parra Parra, Jorge L. Morelos Hernandez, Pedro A. Marquez Agilar, Marina Vlasova, Jesus Colin De La Cruz Abstract : Carbothermal reduction of metal oxides is widely used both in metallurgical processes and in the production of oxygen-free refractory ceramics. As a rule, crushed coke and graphite are used as a reducing agent. The products of carbonization of organic compounds are among the innovative reducing agents. The aim of this work was to study the process of reduction of iron oxide (hematite) down to iron by waste active sludge (WAS) carbonization products. WAS was chosen due to the accumulation of a large amount of this type of waste, soil pollution, and the relevance of the development of technologies for its disposal. The studies have shown that the temperature treatment of mixtures WAS-Fe₂O₃ in the temperature range 900-1000 °C for 1-5 hours under oxygen deficiency is described by the following scheme: WAS + Fe₂O₃ \rightarrow C, CO + Fe₂O₃ \rightarrow C + FexO \rightarrow Fe (amorphous and crystalline). During the heat treatment of the mixtures, strong samples are formed. The study of the electrical conductive properties of such samples showed that, depending on the ratio of the components in the initial mixtures, it is possible to change the values of electrical resistivity from 5.6 Ω [m to 151.6 Ω]m When a current is passed through the samples, they are heated from 240 to 378°C. Thus, based on WAS-Fe₂O₃ mixtures, heating elements can be created that can be used to heat ceramics and concrete.

Keywords : Fe₂O₃, reduction, waste activate sludge, electroconductivity

Conference Title : ICWMEEE 2021 : International Conference on Waste Management, Ecological and Environmental Engineering

1

Conference Location : Rome, Italy Conference Dates : May 03-04, 2021