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Study of Thermal Processing of Carbon-Containing Material in a Fluidized Bed

The quality of steel products depends on the characteristics of charge and carbonaceous materials. Especially it is significant, for example, in electric steelmaking, where the consumption of graphite electrodes is 4.5-10 kg per one ton of electric steel. Improving the quality of consumable carbon materials directly affects the basic indicators and the improvement of metallurgical technologies. The quality improvement by increasing the purity of the materials themselves is the main trend in development of carbon materials production.

The raw material for manufacturing of carbon and graphite products is petroleum coke, anthracite, natural graphite. The essence of the process is heating the starting material to the temperature of 2000 ° C - 2700 ° C followed by aging, which results partial graphitization of feedstock; sulfur, volatile products, metals and metal oxides, contained in the ash, removal. Two-stage calcination process is used for purification of carbon materials by heating them to temperatures of 900-1200 ° C. This heating removes the main part of the volatile products. The second stage of high temperature –treatment is carried out in electro- thermal furnaces where the temperature is 2700 ° C.

For such purposes, a continuous furnace has been created where the material is fed into the fluidized bed of the carbon material 6 with a particle size of 0,2-2mm. The layer is heated by the passage of current from the central electrode to a peripheral electrode 2, 3. The heated material enters a gas distribution grid through a central hole 5 and then to the water-cooled refrigerator 7 and finally discharged from the furnace at the temperature not higher than 300 ° C. The fluidized bed solves some technical and technological questions at the same time: allows to increase the electrical resistance of the layer as compared to the electrical resistance of the dense layer of carbon material particles; provides removal of volatiles and fumes at high temperature of the furnace chamber.

With the help of SolidWorks program several kinds of furnaces will be simulated and weak points in thermal insulation will be found. The subsequent evaluation of efficiency will be made.