Thermodynamic model of thermal benefication of Ukrainian nanoflaky graphite.

Eugene Strativnov[1)], Yuri Prazhenik[1)], Alex Kozhan[1)], Nikola Sidorenko[1)].

[1)] The Gas Institute of National Academy of Sciences of Ukraine, 39, Degtyarivska str., 03113, Kyiv, Ukraine

Graphite purity largely determines its consumer properties in metallurgy, nuclear-power engineering, electronics, precision engineering etc. Two main directions of graphite purification are known: chemical and thermal [1, 2]. Chemical method involves environmentally hazardous elements (e.g. chlorine and fluorine) or their compounds. So thermal technology for graphite purification at high temperatures is more often used now. Despite wide popularity of this technology, the essence of the ongoing reactions is studied insufficiently. For thermodynamic studies we used the sample of flaky graphite of commercial batches produced at Zavalye graphite plant (Ukraine), with purity 94,33%. The study was conducted using the program "Terra" [3]. The results of calculations are presented in the equilibrium compositions of condensed and gaseous phases. It is shown that with temperature increasing the oxide impurities are reduced and react between themselves, forming intermediate compounds of the type Fe_3C, $MgSiO_3$, $MgAl_2O_4$, $CaSiO_3$, Al_4O_4 etc. The graphs show that aluminum, magnesium and calcium containing impurities disappear at temperatures 2300, 2400, 2450 K respectively. Iron-containing impurities disappear at 2800 K, and silicon at 3000 K. Removal of oxides occurs by reducing them to metals, with formation of a more stable double oxides. The obtained data give a complete picture of transformations in enriched sample, including formation of intermediate compounds and evaporation of reduced metals. Approximately 99,94% purity of graphite is achieved at a temperatures of 2900-2950 K.

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2. Small mining encyclopedia. 3 T. ed V. S. Beletsky. — Donetsk: Donbass, 2004. — ISBN 966-7804-14-3.

3. Egorychev, V. S. Calculation of equilibrium composition, thermodynamic and thermophysical properties of combustion products of rocket fuels SPK TERRA: proc. manual / V. S. Egorychev. – Samara: publishing house of Samar. State Aero-space. University press, 2013. – 72 p