Nanotechnology and nanomaterials

Synthesis of thermally expanded graphite. Modeling of the physical processes and design of reactors.

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Thermally exfoliated graphite (TEG) is one of the key important nanomaterials of carbon origin [1]. Due to its unique properties (chemical and thermal stability, ability to form without a binder, elasticity, etc.), it can be used as an effective absorber [2] of organic substances and a material for seal manufacturing [3] for such important industries as gas transportation and automobile.

The starting material for the TEG production is oxidized graphite (OG). OG heating by heat from combustion of liquid or gaseous fuel is currently the most common method. For intensification of heat exchange between OG particles and the flow of fuel combustion products, the turbulence in the reaction zone is increased. Also, OG feeding is accomplished directly into the core of the flame [4].

Therefore, modeling of physical processes occurring inside such devices is proposed to be carried out by 3-D with the help of modern software systems (for example, ANSYS and SolidWorks). In this manuscript, we considered the new “vortex-type” reactor (see fig. 1).

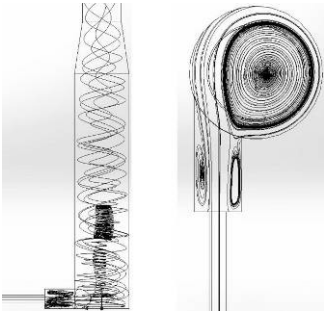

Fig. 1. Flows in the longitudinal (left) and transverse (right) cross sections of the “vortex-type” reactor.

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