The synthesis of carbon nanotubes by thermal pyrolysis of hydrocarbons

Gaukhar T. Smagulova*, Bakhytzhan T. Lesbayev, Ayagoz Y. Bakkara, Zulkhair A. Mansurov

The Institute of Combustion Problems, 172 Bogenbai Batyr St., 050012, Almaty, the Republic of Kazakhstan
*e-mail: *smagulova.gauhar@inbox.ru*

Discovery of nanomaterials was the beginning of a new "era" in the history of science worldwide. Among the broad class of nanomaterials, carbon nanotubes occupy an isolated position due to their unique physical and chemical properties and prospects of practical application. In our work for the synthesis of carbon nanotubes was used unit for thermal pyrolysis of gaseous hydrocarbons. Propane and butane were used for this purpose. As a buffer gas argon was used. Experiments were conducted with different ratios of hydrocarbon and argon. For catalytic substrates metal plates of nickel and copper were used. To activate the catalyst surface and creation of defects that are centers of growth of carbon nanotubes, the surface of metal plates was treated with sandpaper of different markings. Hydrocarbon fuel (butane or propane) has ranged from 200 to 600 cm^3/min and argon from 400 to 600 cm^3/min, and pyrolysis temperature was 550-920°C. Experiments have shown that the best samples of carbon nanotubes were obtained in the ratio of 200/600 cm^3/min of butane-argon mixture with usage of a copper plate. These experiments produced multi-wall nanotubes which have a diameter of 30-40 nm. Also, the effect of the electric field on the growth of carbon nanotubes was investigated. It has been determined that application of an electric field of negative polarity influences on the length and structure of the resulting carbon nanotubes. Produced nanotubes were used for receiving of fiber composite materials based on polymethylmethacrylate by method of electrospinning.