EXTRACTION OF FULLERENES BY TOLUENE VAPORS

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Annotation

The paper considers the process of fullerene purification and separating into components using the Soxhlet apparatus within 5 cycles. Fullerenes were synthesized using an arc synthesis apparatus in atmosphere of helium.

Keywords. Fullerenes, arc synthesis, toluene, extraction, Raman spectroscopy.

Introduction

To date, two methods are most often used for obtaining the amounts of fullerenes: high-temperature laser evaporation or the “laser furnace” method and the direct-current electric arc discharge method. In these methods, a mixture of empty fullerenes (C_{60}, C_{70}, C_{76}, C_{84}, etc.) with fullerenes are simultaneously formed. The production of fullerenes requires subsequent extraction processes from the carbon soot and the separation / purification of fullerenes from empty fullerenes.

The stage of extraction of fullerenes from fullerene-containing soot with organic solvents is the most responsible at this stage of fullerene production, since the amount of product obtained in the subsequent stages depends on the completeness of extraction of fullerenes. The extraction methods used today differ with the used solvents, the extraction time, the process temperature, as well as laboratory devices. In this work, toluene was taken as a base solvent, and cleaning was carried out on a Soxhlet apparatus.

Experiment

In this experiment the nanostructured soot was obtained. Also, during the synthesis, a “deposit” was obtained, presented from the burnt cathode graphite rod, which varied depending on the pressure of the buffer gas in the reaction zone of the experimental conditions. In such an experiment, it was possible to obtain amorphous carbon, single-walled nanotubes (SWNTs), and multi-walled nanotubes (MWNTs). The main component of the “deposit” is amorphous carbon. Then, after weighing, carbon soot was packaged in filter paper, which passed 5 cleaning cycles on a Soxhlet apparatus. The Soxhlet apparatus is used to evaporate at a low temperature and isolate fullerite crystals, thereby isolating a mixture of fullerenes from carbon soot. The isolated fullerenes from the soot were evaporated, thereby forming solid crystals called fullerites. An optical image of fullerite crystallites were obtained at a change in current, where one can see a change in the geometric shape of fullerite on the dependence of the supplied current to graphite electrodes using a direct current source that served as a welding rectifier. An analysis of Raman spectroscopy showed the presence of the obtained crystals of C_{60} and C_{70}. The position of the peaks in the spectrum of the studied crystals — fullerites — corresponds to the peaks of sample C_{60} and C_{70} presented in the references [1, 2].

REFERENCES

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