PERSPECTIVE APPLICATION OF GRAPHENE STRUCTURES OF OBTAINED USING AROMATIC HYDROCARBONS

Baitimbetova B.A.[1], Ryabikin Yu.A.[2], Sultanov F.[3], Nikulin V.E.[4], N.G.Prikhodko[3], Mansurov S.A.[3]

[1]K.I.Satpaev Kazakh National Research Technical University, Almaty, Republic of Kazakhstan
[2]Physical and Technical Institute, Almaty, Republic of Kazakhstan
[3] Institute of Combustion Problems, Almaty, Republic of Kazakhstan
[4]al-Farabi Kazakh National University
baitim@physics.kz

INTRODUCTION

The graphene is considered as a promising nanotechnology material capable, in many areas of technology, of replacing carbon nanotubes in nanoelectronics and other area. The graphene carbon film is a considerable interest for use in industry, since it has unique properties. The graphene is fundamental to creation of highly efficient hydrogen storage in hydrogen energy [1-4].

Producing graphene in a scientific laboratory is a well-known method which is based on mechanical cleavage or exfoliation of the individual layers of graphite. This method allows us to get high-quality graphene samples with high carrier mobility. The main challenge faced by many experiments is the bundle for one layer. However, processing of ultrasonic could be a contributing factor to get high quality of graphene structure.

One of the main disadvantages of this method include the fact that the graphene samples are small in size and can be obtained manually, which limits its use for large-scale production of graphene necessary for respective areas of nanoelectronics [5]. The proposed procedure for obtaining graphene by sonication pure graphite with this disadvantage is eliminated of aromatic hydrocarbons. This method is important for a wide range of scientific and industrial processes.

The aim of our work is to obtain graphene more simple and cost-effective methods and follow-up studies of the structural features of the various physical and chemical methods [6].

METHODOLOGY

The ultrasonic method is particularly useful in processing the chemical interaction of the organic solvent of benzene rings and graphite which leads to the destruction of the weak carbon bonds between planes of graphite. The ultrasonic method is one of the more practical ways of separation pure graphite in aromatic hydrocarbon in the presence of the ultrasonic field [6].

This method is particularly useful in processing the chemical interaction of the organic solvent of benzene rings and graphite which leads to the destruction of the weak carbon bonds between planes of graphite fig 1.

The ultrasonic field contributes to more efficient destruction of the van der Waals bonds. In this method uses benzene as the solvent, in contrast to other methods using acid, solutions alkali, provides a more efficient way to obtain graphene device application structures.

The research describes a method of obtaining graphene structures and investigates the structural features of the methods of Raman spectroscopy, scanning microscopy, scanning and transmission electron microscopy of high resolution.

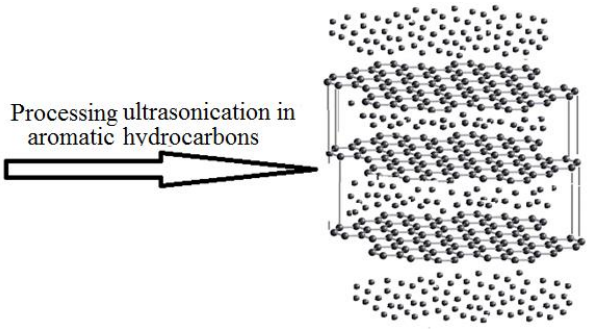

Figure 1 the scheme of graphite bundle

RESULTS AND DISCUSSION

Raman spectra show increasing processing time graphite with benzene in ultrasonic field occurs increase the number of graphene structure fig 2. Figure 3 shows the elemental composition of the sample treated with ultrasound for 10 minutes in benzene pure graphite. The sample consists of carbon, however the copper presence in the spectrum reflects the composition of mesh material in the preparation and removing spectra TEM conditions.

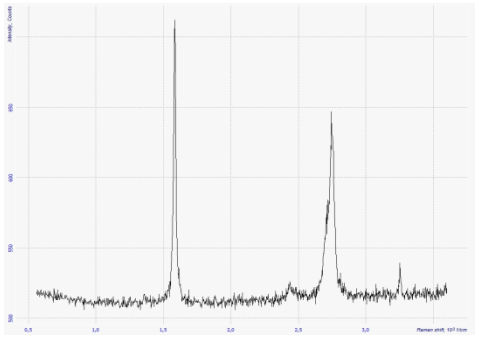

Figure 2 Raman spectrum of graphite with benzene after processing with ultrasound

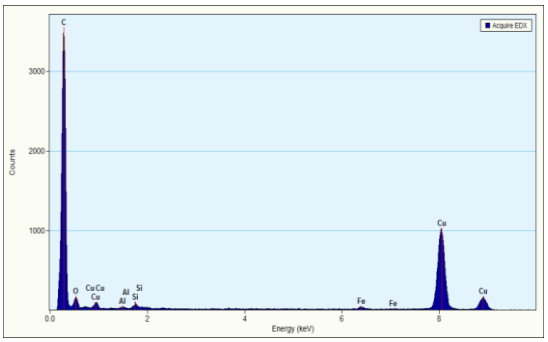

Figure 3 the elemental composition of the sample

This study has shown effective of producing graphene structures using aromatic hydrocarbons by ultrasonification.

REFERENCES

1. Geim A.K., Novoselov K.S. The rise of grapheme. (2007), Nature Materials. V6(3).183–191.0
2. Tkachev C.V., Buslaeva E.Yu., Gubin C.P. Graphene - a new carbon nanomaterial (2011) Inorganic Materials., V. (47), 1, 5-14
3. Andrievskii RA Hydrogen in nanostructures (2007). Physics-Uspekhi.. V.177 (7), 721-735.
4. Baitimbetova B.A, Vermenichev B. M., Ryabikin Yu. A., Mansurov Z. A., Abdikasova A. A.Study of graphene formed in the atmosphere of vapors of aromatic hydrocarbons. (2015), Russian Physics Journal, V58 (3), 394-398
5. Gubin C.P., Cheglokov A.V., Buslaeva E..YU., Tkachev C.V. Patent WO 2012/166001 A1, кл. B82B3/00, B82Y40/00, C01B31/02. A method of producing graphene.
6. Baytimbetova B.A, Vermenich B.M. A method for producing graphene. //Patent 2013/0559.1