

## ULTRASONIC PURIFICATION OF CARBON NANOSTRUCTURES

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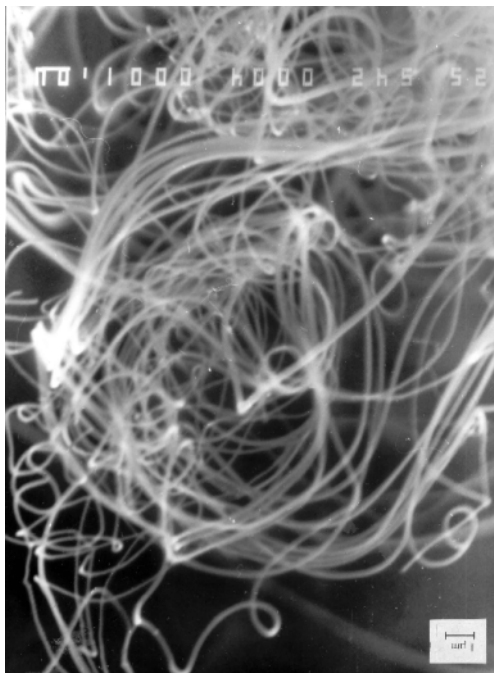
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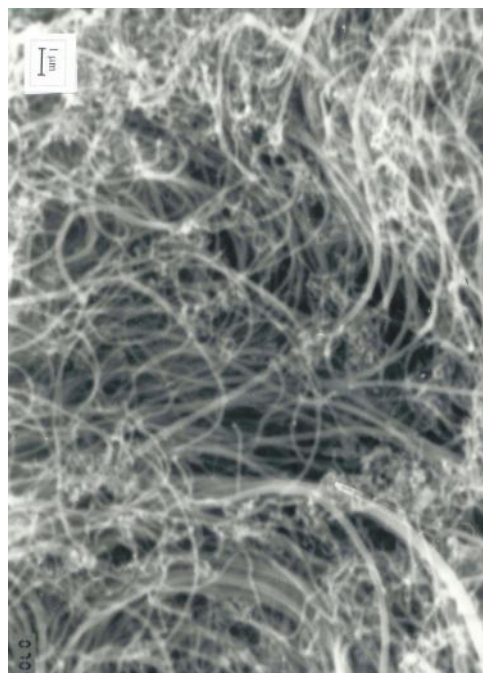
### Introduction

Application of different methods for synthesis of carbon nanostructures gives the product with a large amount of impurities. The content of impurities depends on the method in

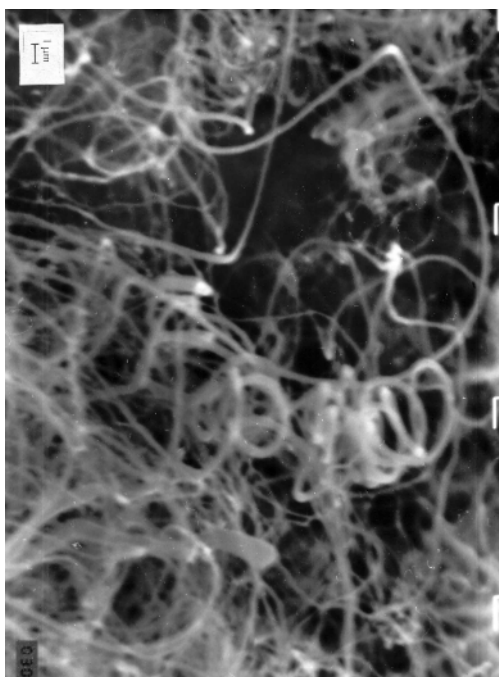
use and includes nanostructural carbon, amorphous carbon, fullerenes, petroleum fractions, metals-catalysts and other products. Impurities greatly confine investigation and application of the material produced. Different



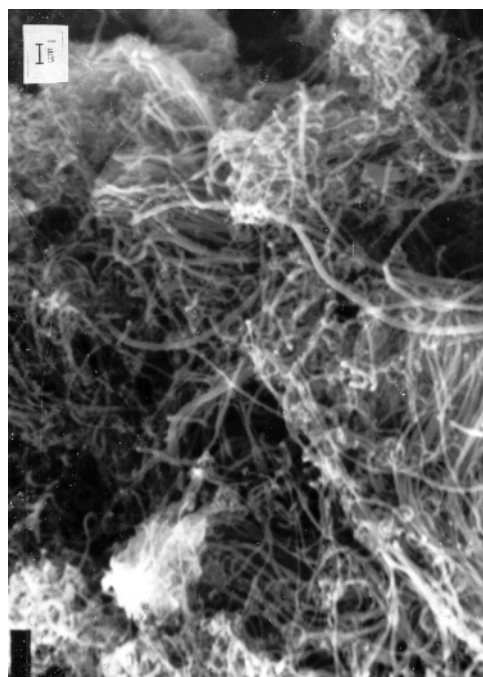
**Toluene**



**Acetone**

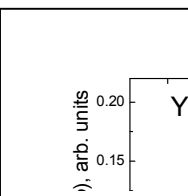


**Benzol**



**Alcolgol C<sub>2</sub>H<sub>5</sub>OH**

Fig.1 Ultrasonic purification of carbon nanofibres



approaches to solving the problem on material purification were elaborated. They are based on oxidative processes involving acids or mixtures of acids in solution and gases, filtration, separation by centrifuging or using chromatography. At any approach employed for purification, the first stage must be preliminary purification. To conduct the real purification, in many cases the initial material is subjected to strong dispersing processes in solvents or water such as pulverization, sonic or ultrasonic treatment with and without surfactants. In many cases several phases of purification are required even at high temperatures at which oxidative treatment with acids is necessary and preferable to remove metal and carbon contaminating materials. The method for single-wall carbon nanotubes purification by high-temperature oxidation is common. The yield of materials with a high degree of purity is about 30%. However besides the low rate of material production, oxidation of nanotubes and further modification of their molecular structure occur.

#### **The object and experimental conditions**

Purification of nanotubes is carried out in the laboratory and starts with preliminary purification. The preliminary stage of purification during ultrasonic treatment of the product is carried out on the ultrasonic powder dispenser in the medium of one of hydrocarbons. This allows us to remove the part of amorphous carbon and separate the required nanostructures from the by-product mechanically. Ability of different solvents to dissolve by-products that form during synthesis

of nanostructures has been investigated in this work.

46 different solvents with different compositions and nature have been used in the experiment.

The thermal analysis of samples on the derivatograph Q-1500D has been employed to evaluate the degree of purification and to determine the presence of one of another impurity phase in the product.

#### **Results and discussion**

Preliminary investigations have shown that not all the solvents can be used with the same success as a medium for ultrasonic treatment. Toluene and benzene are especially effective, and alcohol and acetone are less effective. Aromatic hydrocarbons seem to dissolve by-products, which form parallel with carbon nanostructures and have a gluing effect of nano-objects, better. The photographs of nanofibers of the same sample treated by ultrasound in the medium of different solvents are given in Figure.

#### **Conclusions**

The investigations have shown that two hydrocarbons, toluene and benzene can be optimum from the viewpoint of performance, prize, harm for personnel and prevalence. Toluene and benzene make it possible to dissolve effectively by-products that have a gluing effect on elements of the synthesis product.