Abstract—Research carried out by the scanning atomic force microscopy shows that in carbon film are formed carbon nanowire length 300nm and a diameter of 10-40nm. By method of Raman spectroscopy has confirmed formation the nanowires and carbon tubes on detection of the vibrational mode (G-band) at a frequency of 1581 cm$^{-1}$. X-ray study of the structures obtained showed the presence the crystallite of car.

Keywords— carbon nanowires, the plasma of methane, nanocarbon, crystallite of carbon.

I. INTRODUCTION

CARBON nanomaterials with unique electrical, magnetic, optical, and mechanical strength, promise a revolution in materials science and electronics. Carbon nanotubes filled with 3d-metals and their compounds exhibit interesting magnetic and electrical properties [1]. In this regard, their preparation and study are relevant not only from a fundamental point of view, but also from the point of view of possible applications.

In this paper considered the single-layer nanowires, obtained decomposition of graphite by plasma in methane introduction of argon gas [2-3]. In this case, the structure of the nanowires obtained amorphous and columnar, which is typical for the use of optical applications in optoelectronics.

The study of carbon nanowires was carried out using various physical methods: X-ray diffraction, scanning electron microscopy and Raman spectroscopy.

The micrographic images, shows that the structure is a network of nanowires strictly vertical to the surface of the substrate. Length obtained is nanowires about 300 nm, and the diameter varies in the range of 10-40 nm. The profile of sectional shows that the number of nanowires in the range 0 to 0.5 mm is 9-12, etc.

To study the optical properties of nanocarbon structures has been measured transmittance of the light directed perpendicular to the surface structures. Transmission spectrum in the wavelength range 160-1100 nm is shown in Figure 2.

Of the transmission spectrum shows that in the short-wavelength region around 400 nm, the transmittance of 65% in the visible region and 75% in the near-infrared region is about 80% with a further gradual increase. Have transparent carbon nanowires in the visible wavelength region is sufficient value for use in optoelectronics

Further, in order to determine structural phases were investigated Raman spectra of carbon nanostructures obtained from the plasma of methane.

It is known that in the Raman spectra of carbon can observed three of the most intense lines. Line G at $\sim 1581\text{sm}^{-1}$
is associated with doubly degenerate phonon mode E2g symmetry from the center of the Brillouin zone (BZ). D line at \( \sim 1350 \text{sm}^{-1} \) occurs in samples with a large number of structural defects. Line 2D \( \sim 2600-2710 \text{sm}^{-1} \) is associated with the resonant light scattering involving two phonons of equal energy, but the opposite direction of the pulse.

One of the informative methods for studying crystal objects, including nanostructured materials, is the X-ray structure analysis (Fig. 5).

From the analysis half-width the X-ray of peak was estimated crystallite size of carbon, which is \( L = 1,2 \text{ Å} \) with interplanar distance \( d = 3,98 \text{ Å} \). In the peak of the absolute value of the integrated intensity is 100 at angles \( 2\theta = 22,280 \). This fact also testifies to the compaction of carbon depositions. From the analysis the half-width of the X-ray of peak has been evaluated a size crystallite of carbon and absolute values of the integrated intensity

REFERENCES
Microbial Production of a Bio-surfactant and Its Application in Ultrasound Assisted Synthesis of Silver Nano-particles

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Abstract—silver nano-particles (AgNP’s) have been used extensively as anti-bacterial and antioxidant agents in the health industry, textile coatings and a number of environmental applications. Green chemistry methods involving use of various bio-molecules capable of performing dual role as reducing and stabilizing agents are emerging as a viable alternative to environmentally hazardous chemical synthetic procedures to obtain AgNP’s. These biosynthetic methods are gaining lot of attention due to their biodegradability, low toxicity and thus eco-friendly nature. In this work we have used Starmerella bombicola NRRL Y-17069 for the fermentative production of a bio-surfactant called as ‘Sophorolipid’ and utilized it as a reducing and stabilizing agent for the synthesis of AgNP’s. Assistance of ultrasound (US) for a very short period of time (< 2 min) was sufficient to synthesize AgNP’s at room temperatures (25-30º C). Further, particle size and the size distribution with aid of “US” was much lower than AgNP’s synthesized without aid of “US”. Synthesized AgNP’s with the aid of ultrasound and use of sophorolipids as reducing and stabilizing agent were having average particle size of 80 nm with polydispersity index of 0.175 and were found to exhibit excellent antimicrobial activity against both gram positive and gram negative organisms.

Keywords—Antimicrobial, Bio-surfactant, fermentation, Sophorolipids, Silver nano-particles, sonochemistry, ultrasound.

I. INTRODUCTION

Biosynthetic methods employing naturally occurring reducing agents of biological origin having dual role as reducing and stabilizing agents such as polysaccharides, microbial biosurfactants and plants extract, i.e. green chemistry methods have emerged as a simple and viable alternative to more complex chemical synthetic procedures to obtain AgNP’s [1]. These biosynthetic methods of synthesis of AgNP’s are gaining lot of attention due to their biocompatibility, low toxicity and eco-friendly nature. AgNP’s are known to have antioxidant and antimicrobial properties [1] surface enhanced Raman spectroscopy [2]. Reduction of AgNO3 by reductants such as citrate, ascorbic acid or borohydride is among the most used methods for the preparation of AgNP’s in aqueous solution [3].

One of the limitations of these conventional methods is limiting starting concentration of AgNO3 that can be used. Most reports on synthesis of AgNP’s describe use methods in which final concentration of AgNO3 in the reaction mixture does not exceed 0.001 M because higher concentrations may lead to aggregation of particles during reductive synthesis. On other side even though many bio-molecules have been recently reported as potential reducing agents for synthesis of AgNP’s, however since most bio-molecules are mild reducing agents, they either requires prolonged time periods for the completion of reaction (8 to 150 hr) or they require higher temperatures up to 80° C or more, for synthesising AgNP’s in shorter time period. [4],[5].

Recently ultrasound assisted synthesis of metallic nanoparticles such CaCO3 and TiO2 nano-particles have been investigated [6],[7]. In the present investigation we have overcome the disadvantages of both (conventional and newer bio-synthetic) methods by application of ultrasound. First we have synthesized sophorolipids which is a glycolipid class of bio-surfactant and used it as a reducing agent for synthesis of AgNP’s. By using sophorolipids which also acted as stabilizing agent, we were able to start with 0.01 M AgNO3 as the starting material. Agglomeration was not observed during synthesis even at such high concentrations due to capping/stabilizing effect of sophorolipids. However as mentioned previously, higher temperatures > 70 to 90º C were required for synthesizing AgNP’s in shorter period of time (10-15 min), whereas at room temperature (25 to 30º C) AgNP’s were not synthesised even after reaction time of 2 hrs. However with the assistance of ultrasound it was possible to initiate synthesise AgNP’s within 2 to 4 min even at room temperatures. Synthesized AgNP’s were having average particle size of 80 nm with poly-disperisty index of 0.175 and were found to have excellent antimicrobial activity against both gram positive and gram negative organisms.

II. MATERIALS AND METHODS

A. Microorganism:

The yeast Starmerella bombicola NRRL Y-17069, capable of producing large amounts of sophorolipids was obtained from ARS Culture Collection, USA. The organism was...