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Design of Aligned Carbon Materials as a Renewable Energy Source for Various Environmental Applications

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Abstract: In the last few decades, a plethora of research work has been done on nanotechnology. Nano technology has gained expeditious application predicated platform. Now a days, aliment packaging companies and R&D are expanding their arms in this domain. But the main thing they are missing. We withal study the toxicity level of CNT predicated products. In concurrent, we have utilized MatLab 2016 and Virtual Nanolab 2017 for artificial neural network (ANN) withal to verify the experimental data with simulated data. This all study fixated on the single source of electron beam engenderer from CNT, which may be utilizable for the sundry environmental applications such as in renewable energy sector.

Keywords: Carbon Nano Tubes, Processed Food, Sol Gel Process

1. INTRODUCTION

We have demonstrating our work by using carbon materials i.e. Carbon Nano Tubes (CNT) [1,3,15]. We have much focused on chemical en route method to achieve our target, due to repeaters of the whole process [4, 21, 22]. Using Sol Gel process, we make composite of CNT based material and studies their toxicity, thermal, mechanical, electrical and morphological properties [1-3].

There are numerous food companies which are focusing on storing the food in various types of packaging system to serve to the nation and others [5, 23, 24]. In latest decade, tetra pack is there in market, in which solid, semi liquid and liquid food products are packed and ready to serve to the people [4]. But the main drawback in such kind of packages is their sustainability and life time [2, 7, 16]. Also the moisture or heat generated from the food are trapped and badly affected the packed food quality during transportation and preserve time [5].

The wrapping is main domain, in which material of wrap is changed [3, 9, 17, 25]. Carbon based materials are main concept, they are one, two, three and four–dimensional (1D, 2D, 3D, 4D) such as quantum dots/particles/tubes/origami of various elements at nano (10-9 meter). Nanotubes are about 1/50,000 as thick as a human hair, and between 1 and 30 nanometers in diameter. There are two types of CNT: SWCNT and MWCNT, having Length = few tens µm, diameter = few nm and purity = in the range of 90s %. Figure 1 shows the structure of single walled carbon nano tubes (SWCNT) [6-7, 18, 26].

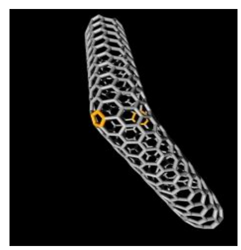

Fig. 1: Structure of carbon nanotubes

Experimental Process: Chemical sol gel methods are demonstrated in figure 2 (a-b-c).

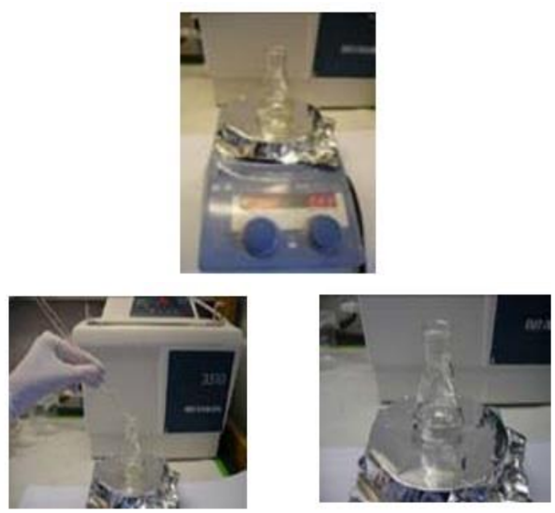

Fig. 2: Sol gel process (a) at various time (b) mixing of metal oxides(c) heat treatment

Chemical Method: Chemical Methods are used to activate the sides of CNT. There after substrate activation -acid treatment are being done. The follow-up of the methods/protocols are as follows (figure 3):

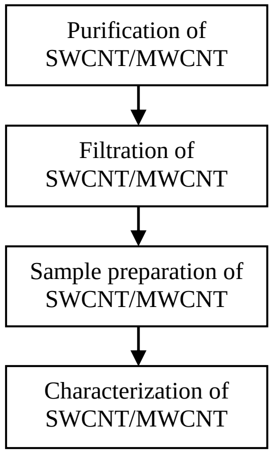

Fig. 3: Flow chart for alignment of Carbon Nano Materials

2. Results and Discussion

Various kind of results are procured for the confirmation of attachment of molecules, activation of various substrate, alignment of nano materials, development of thin films, toxicity level detection, trapping of solar radiation, and electrical properties. There properties are sub headed as follows:

Electrical Properties: Conductivity of composites films are characterized and summarized in figure 4 (e-f-g) by using EDX instruments. EDX intensity achieved at higher value (au) for CNT at high value of energy (kV). Raman intensity (au) has been extended on y axis with respect to the wave number (cm-1). Sedimentation function (au) v/s centrifugation time (min) are matched and optimized for both experimental as well as numerical fitting [8-10, 19, 27,11, 20].

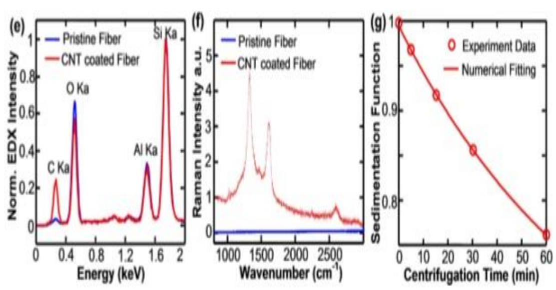

Fig. 4: various profile (e) EDX spectra (f) Raman Spectra (g) Sedimentation profile [1-5, for comparative study]

Morphological Properties: At various resolution and time, Atomic Force Microscopic results are being carried out on glass substrate as shown in figure 5.

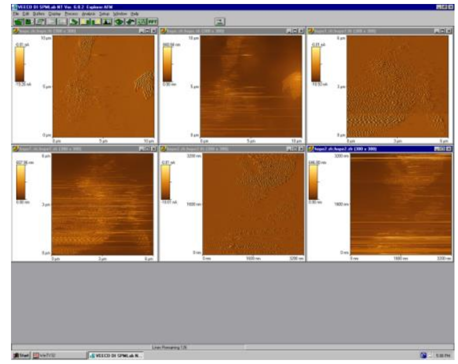

Fig. 5: AFM Images

Toxicity Properties: The fibres of CNT are being demonstrated in figure 6.

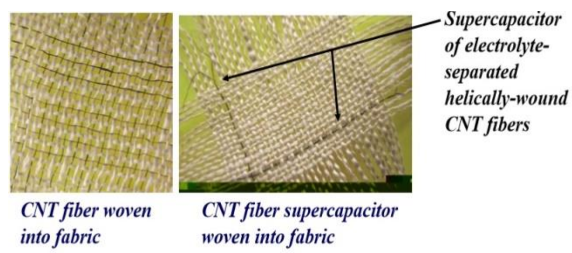

Fig. 6: CNT fibres manufacturing [12, 27, 28]

Structural Properties: Structure is being carried out by using Fourier Transform Infra-Red spectroscopy, figure 7. While the figure 8 and 9 shows the Scanning Electron microscopic results of various samples at different resolutions.

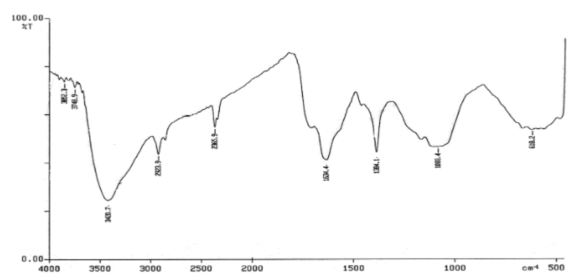

Fig. 7: Fourier transforms infrared spectra for MWNTs-COOH

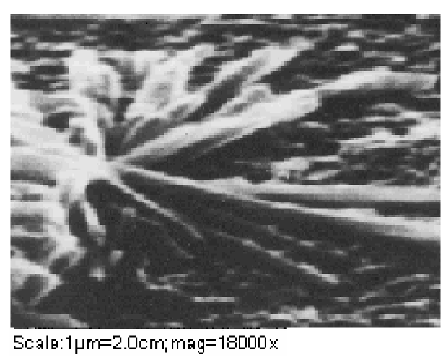

Fig. 8: Scanning Electron Microscopy at 1800 Times Resolution

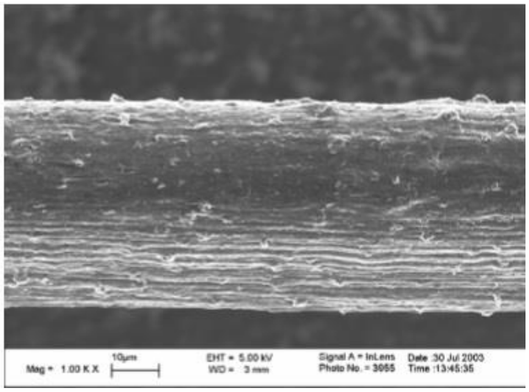

Fig. 9: Scanning Electron Microscopy at 100 Times Resolution

Mechanical Properties: Figure 10 shows mechanical properties on nano based products. In the figure 11, capacity vs single layer fractions have been demonstrated.

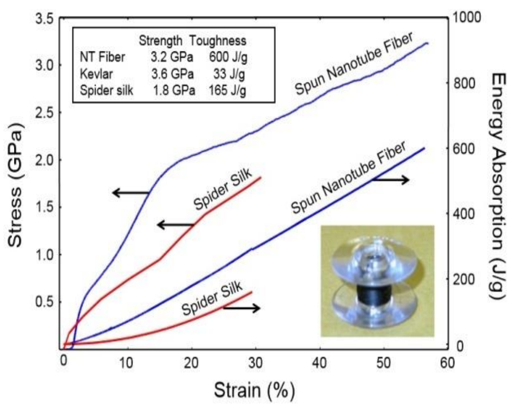

Fig. 10: Tensile property measurement [13]

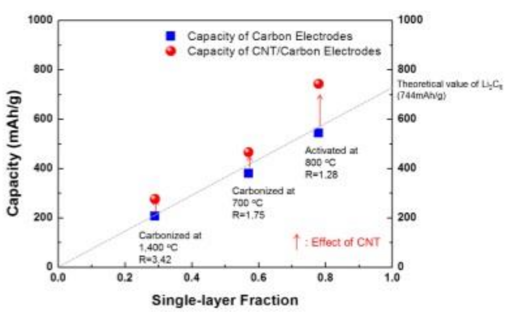

Fig. 11: Capacity measurement [14]

3. Conclusion

We have demonstrated selectively-attached, vertical alignments of SWNTs on chemically functionalized silicon substrates by controlling chemical reactivity. At the end of procedure, thin films showed the blockage of various types of radiation falling on food and food packages internally.

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