

The preparation of carbon nano tubes



The preparation of carbon nano tubes is takes place by treating 1N cobalt metal salt prepared in water solution with the arginine i. e separated from the egg protein. Arginine comprising of amino acid as a monomer, when reacted with alcoholic solution of cobalt salt forms complex with Co^{2+} ions. In this complex lone pair present on the nitrogen of NH_2 and oxygen of COO^- of $COOH$ group formed cross link between two amino acid chains. The Cobalt metal arginine complex is taken out and kept for drying. After the preparation of cobalt arginine complex, the extra metal ions are removed from the surface by washing it from 1N HCl acid solution. In order to obtain CNT's the complex was decomposed. The decomposition takes place at temperatures 600°

Atomic force microscopy results confirm the maximum peak height is around 179. 25nm. The evaluation of the result confirms the synthesized CNT's are multiwall and the particle size is around 20 nm . The maximum peak height obtained is of 179. 25 nm with no peaks in between. The distance between peak to peak in y-direction is 179 nm and in z-direction is 89. 78 nm Average sizes of peaks are 101. 38 nm. The roughness of the synthesized nanoparticle is approximately 20. 93 nm which can be calculated by. " R" a= $\frac{1}{L} \int_0^L [Z(x)]^2 dx$. Where Z(x) is the function that describes the surface profile analyzed in terms of height (Z) and position (x) of the sample over the evaluation length " L".

The second moment of material is calculated to be 104. 649. Root mean square of the measured carbon nano tubes mean slope. is 25. 94 nm.

$Rq = \sqrt{\frac{1}{(N-1)} \sum_{i=1}^{(N-1)} (\frac{\partial z_i}{\partial x_i} - \frac{1}{(N-1)} \sum_{i=1}^{(N-1)} (\frac{z_i - z_{i-1}}{(x_i - x_{i-1}))})^2}$ Skewness (Rsk) measure the degree of asymmetry of surface height

distribution is found to be range of -0. 1049. It encapsulate load bearing capacity, void fraction, and characteristics of nontraditional mashing processes. A negative value of R_{sk} indicates that the surface contains the cracks, group of valleys and planar type of structure. Therefore a negatively skewed surface is good for surface in proximity and moving relative to each other. The distribution of positive and negative values indicates the existence of protruding grist.

Kurtosis is a measure of the dissemination of sharp point above and below the mean line. Coefficient of kurtosis is -0. 1521 which indicates the surface is uneven with many patches raised above the surface as the value of kurtosis is less than 3. It has been observed that number of peaks crossing above the upper threshold and below the lower threshold per length of trace in a profile is in between 20-100 peak count for 60 -160 nm bandwidth range.

TEM image predicted the synthesized material is MWCNTs having the outer diameter range is 6-60 nm, and their wall consist of several graphitic layer keep aparted by 0. 36nm. This results confirms the chirality is existing in the different part along the nanotubes . The TEM image of a MWCNT, along which have the same chiral angle was detected in different local areas. In Figure electron diffraction patterns are an overlap of two simple hexagonal patterns, indicating that all of the layers in the MWCNT have nearly identical chirality. The diffraction spots closely exhibit center of symmetry, it suggests the presence of well-defined shuffle in these nanotubes.

The inspection of (101l) (l = 1, 3, 5) reflections shows that the positional correlation between the internal structures of the walls has a tendency of AB arrangement. In addition to the sharp (0002) and (1010) reflections, (1011) grid edging become visible, which result from the bent graphitic sheets. A fast Fourier transformation (FFT) from the wall of the nanotube obviously shows (1011) lattice fringes. The FFT for the hollow area of the nanotube also confirms the characteristic of identical chirality.

The short smooth curving line on the equator 002, 004 etc , clearly show the actuality of graphene layer with respect to vertical tube axis . However, diffraction pattern from the plane in the forms $\{100\}$ and $\{110\}$ shows complete at the radii corresponding to d spacing of 0. 209nm and 0. 123nm respectively. The analysis predicted the presence of brittle fracture is a concern, because catastrophic brittle fracture occurs due to the elastic stress that is present on the surface of the morphology and usually propagates at high speed, sometimes with little associated absorbed energy. Fracture occurring in a brittle manner cannot be anticipated by the onset of prior macro scale visible permanent distortion to cause shut down of operating equipment, nor can it be arrested by a removal of the load except for very special circumstances.

Metallic surface fracture showing large number of splitting may show cracking on more than one crystallographic plane within a given grain, leading to the most common feature associated with brittle faceted fracture river line. These lines may form by a ductile process, but the slip deformation that created them is not resolvable and such fracture is not described as quasi-cleavage. Alternatively, with less constraint, the connecting ligaments

may become sufficiently large that micro void coalescence is observed in thin bands weaving through the general cleavage surface.