

SYNTHESIS AND PROPERTIES OF NANOTUBE/EPOXY COMPOSITE



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INTRODUCTION

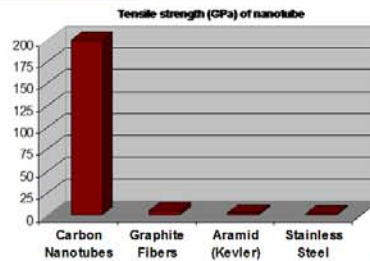
Carbon nanotubes (CNT)

Originally discovered as by-products of fullerenes (C₆₀-buckyball). They consist of multi-graphene cylinder closed at either end with caps containing pentagonal rings with outer diameters of 4-30nm

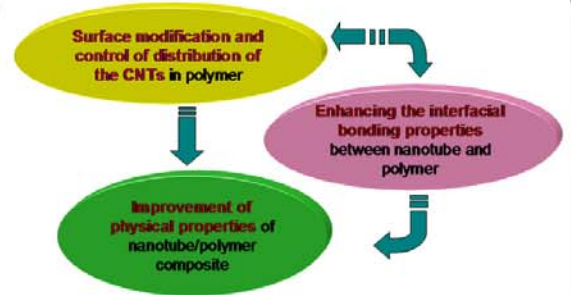


Mechanical properties of CNT

- > 100 times stronger than steel(stress) and 6 times lighter.
- > Higher flexibility than carbon fibers.

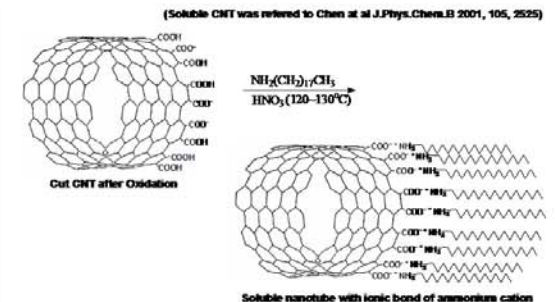


OBJECTIVES & APPROACH



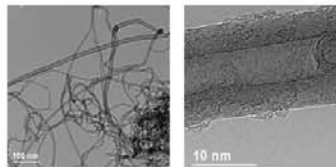
- > Synthesis of soluble carbon nanotube to achieve uniform dispersion and better bonding of CNT in epoxy matrix
- Separated and shortened CNTs resulted from the purification process lead to better dispersion and easier modification of the functional group.
- Functional groups with octadecylammonium or silane improve dispersion and interfacial bonding property in the nanocomposite

SURFACE MODIFICATION OF NANOTUBE AND SYNTHESIS OF THE COMPOSITE

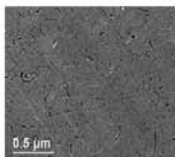


- Soluble nanotube in aromatic solvents such as benzene, toluene, xylene and chlorobenzene was synthesized.
- Soluble CNT with solvent was mixed with epoxy.
- Solvent was removed completely after mixing.
- The epoxy with CNT was cured by adding the curing agent.

NANOTUBE MODIFICATION



TEM pictures of multi-walled carbon nanotube



TEM picture of Oxidized CNT and vinyl ester composite
Most of the nanotubes were dispersed well because of carboxylic acid and carboxylate groups attached during oxidation

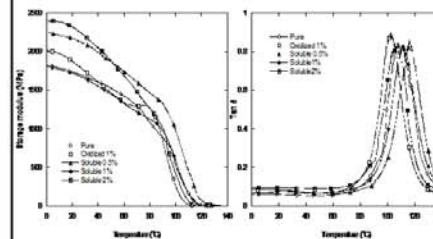
NANOTUBE MODIFICATION



Oxidized CNT (left) and soluble CNT (right) dissolved in xylene

- The soluble property of the oxidized CNT was completely changed with the surface modification with octadecylamine

THERMAL & MECHANICAL PROPERTIES



Storage modulus and tan delta of the nanotube/epoxy composites

CONCLUSIONS

1. Better dispersion was obtained with the soluble nanotube prepared by introducing octadecylammonium
2. Mechanical property of epoxy was much improved by adding small amount of carbon nanotubes.
3. Thermal properties were also slightly changed with the loading of the nanotube

FUTURE WORK

1. Verification of chemical reaction with the functional group
2. Surface modification of the nanotubes with other functional groups for better properties.
3. Characterization of the properties of the nanotube/polymer composites.

ACKNOWLEDGEMENTS

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