Advanced fibre characteristics
- by improving them with carbon nanotubes (CNT) -

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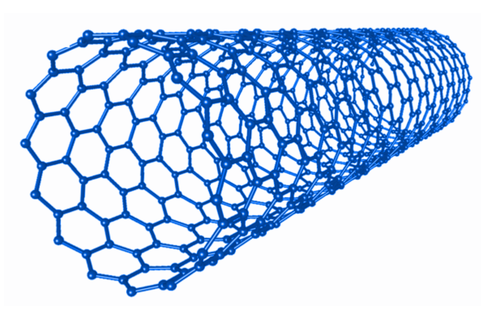
1. Structure of Carbon Nanotubes

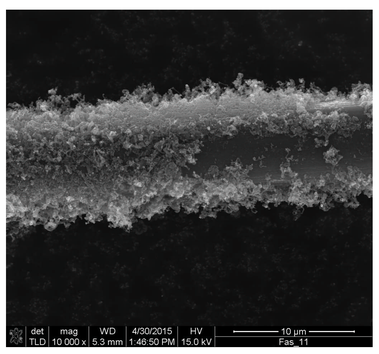


- Allotropes of carbon
- Cylindrical carbon molecules
- CNT are very mechanical stable, electrical conductive and corrosive resistant
- Used in nanotechnology, electronics, optics and other fields of material science

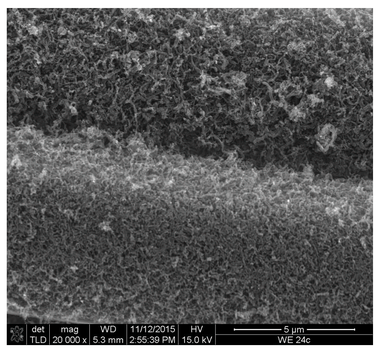
2 . Growth of CNT by CVD Process

CNT growth on fibre by chemical vapour deposition
(carbon source C_2H_2; temperature 750 °C)

Dip coating



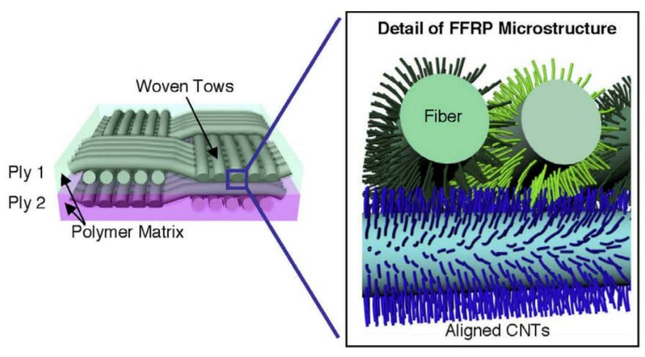
Potentiostatic deposition



Regular radial aligned CNT on fibre after electrochemical deposition of Co nanoparticles.

3. Possible Improvement: radial aligned CNT on carbon fibre (CF)

- Improvement of delamination resistance
- Enhancement of interlaminar fracture toughness
- Heat and electrical conductivity



S. Wicks et al.: Interlaminar and intralaminar reinforcement of composite laminates with aligned carbon nanotubes; Compos. Sci. Technol. 70 (2010) 20.

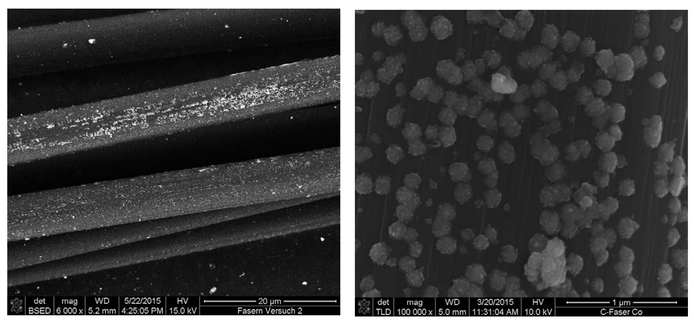
4. Improvement of carbon fibre with Co Nanoparticles

- Catalyst nanoparticles (Co) on CF are needed for CNT growth
- Controlled deposition of Co nanoparticles with small diameter
- High density and regular arrangement is needed
- **Best option: electrochemical deposition**

Dip coating

Potentiostatic deposition

(2 mM $CoBr_2$ solution)

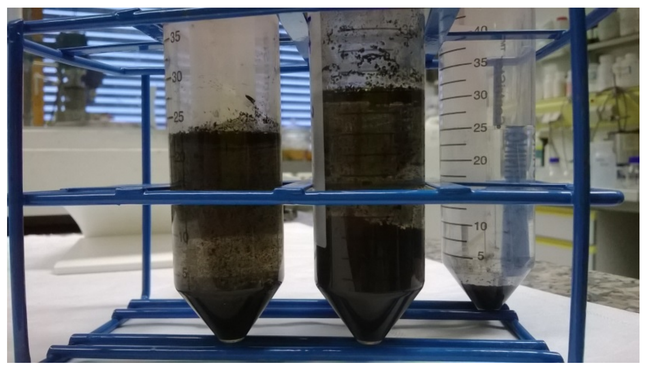


Regular arrangement of Co nanoparticles with very thin diameter by electrochemical deposition.

5. Cotton

a) Deposition of CNT by Dip Coating

Dip coating of cotton in a CNT/tenside/solvent suspension

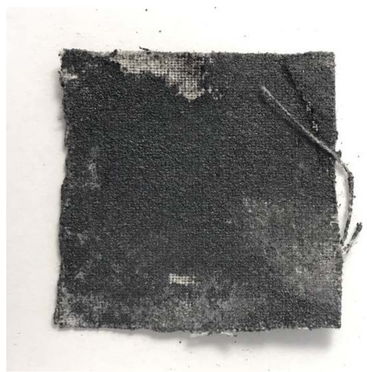


CNT distribution in different solvents after ultrasonic treatment

- Multi wall CNT with carboxy groups
- Controlled deposition of CNT controlled by dip time and dip quantity

b) Improvement of Cotton fibres with CNT

- Improved conductivity
- Improved mechanical properties
- Improved fire resistance
- Possible applications
  - Heating textiles
  - Smart textiles



Dip coating of a cotton textile

Dip coating of cotton fibres

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