Pulsed laser deposition of multiwall carbon nanotube/NiO nanocomposite thin films

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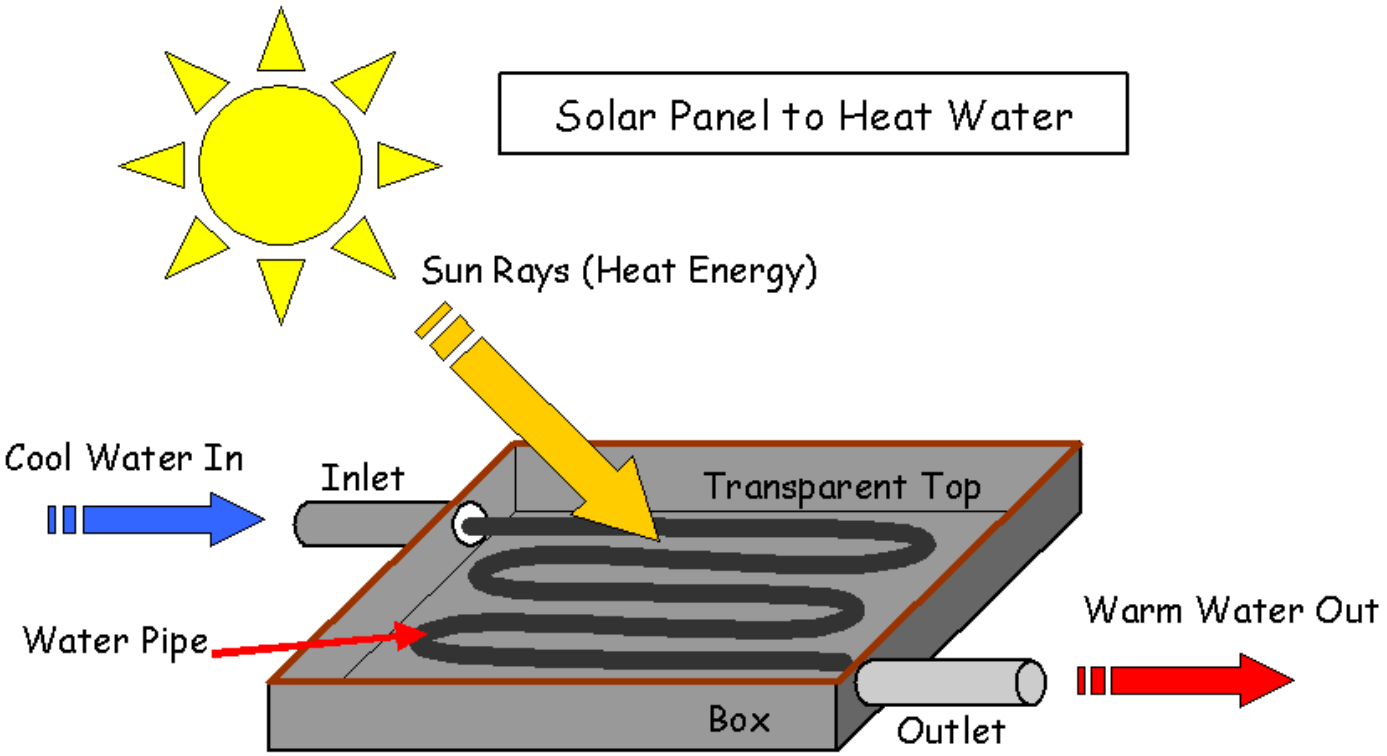
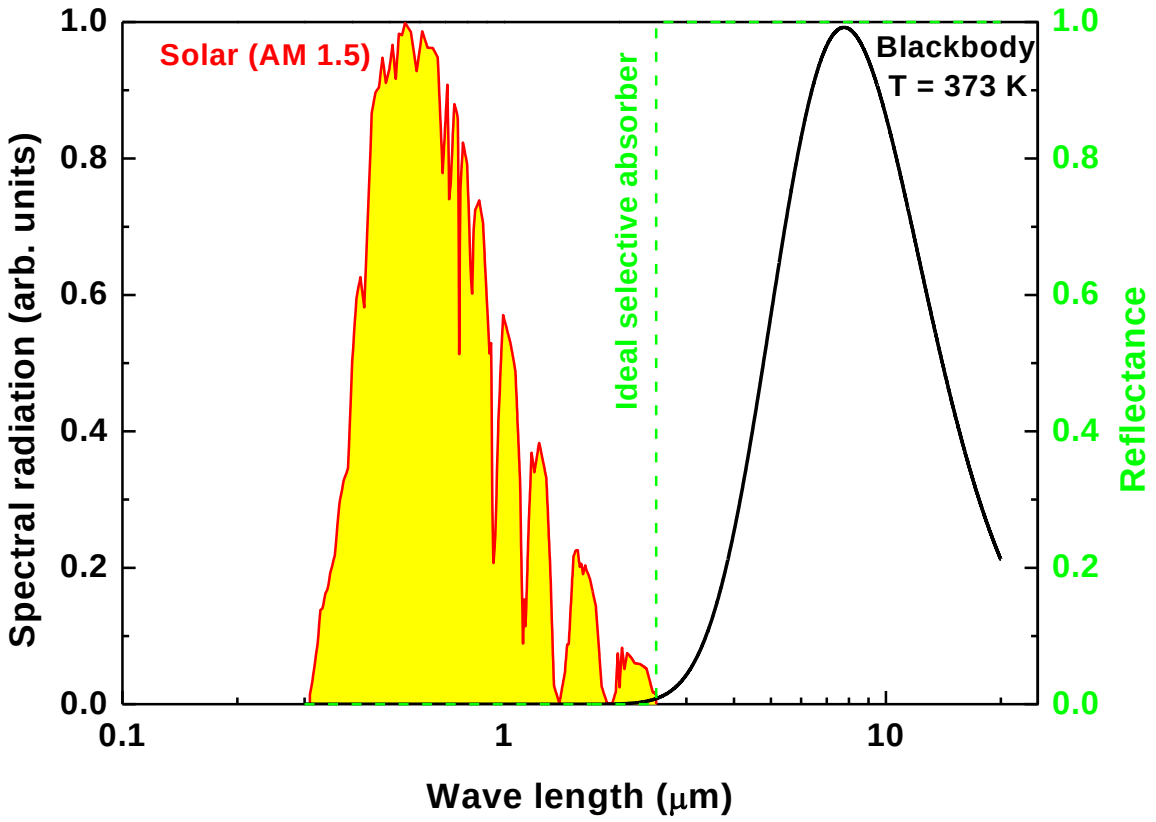
Solar energy available in abundance, but….



Fundamentals of solar absorbers



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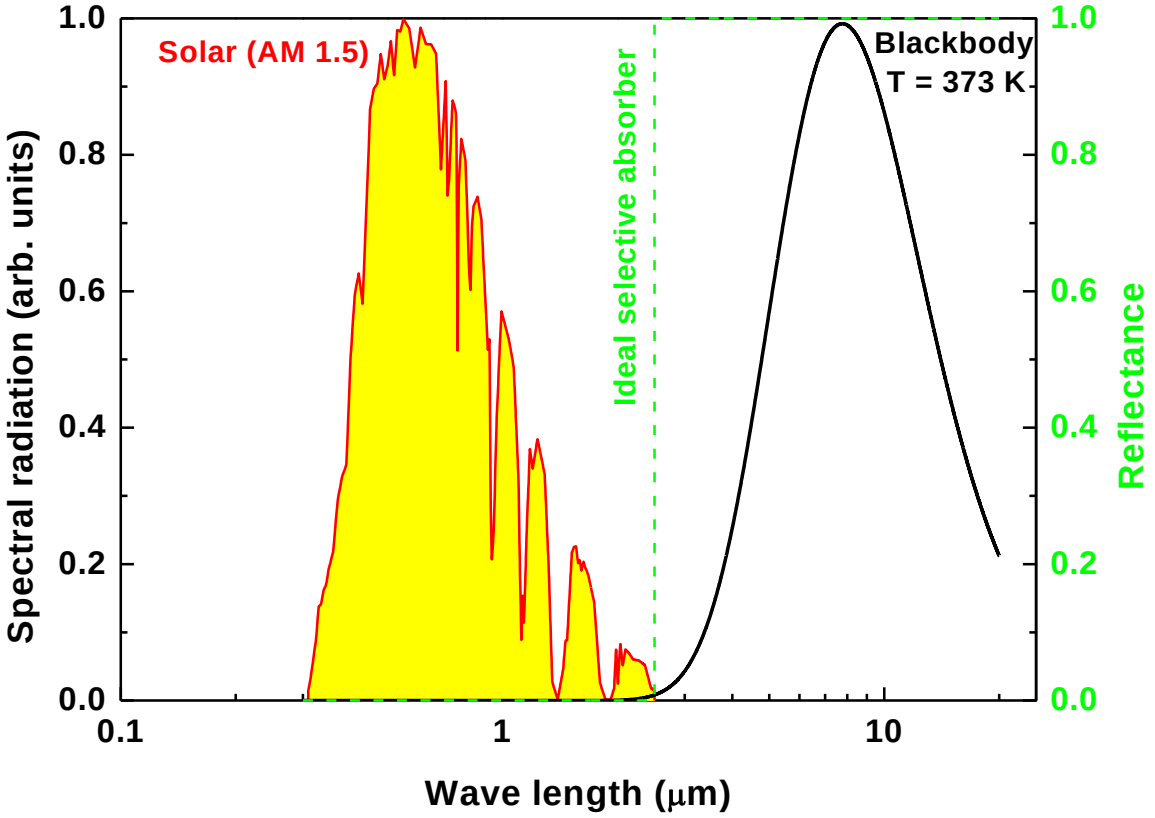
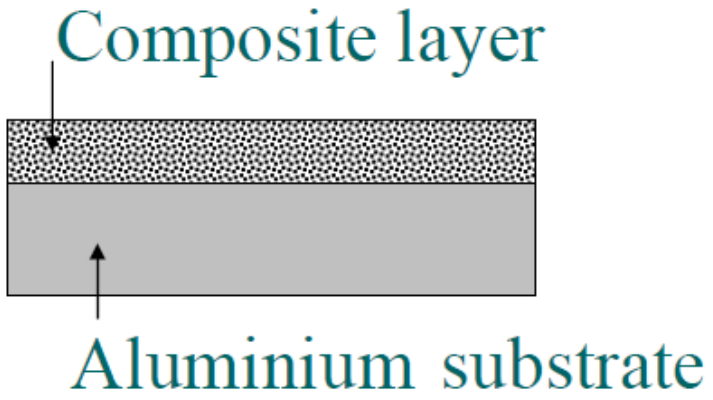
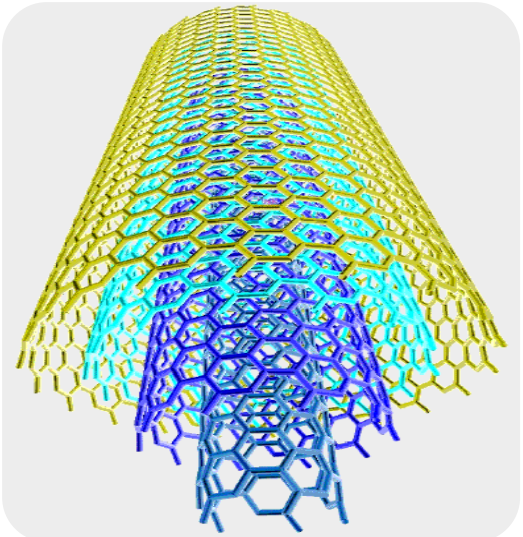
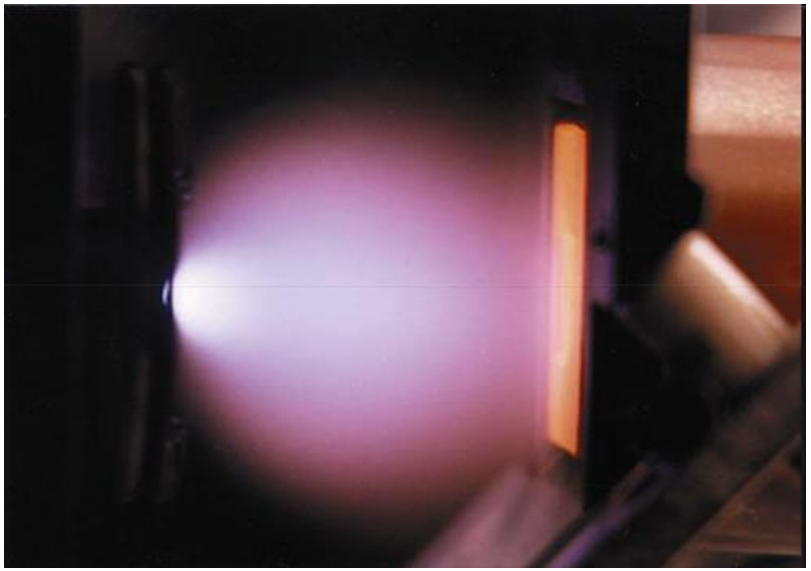




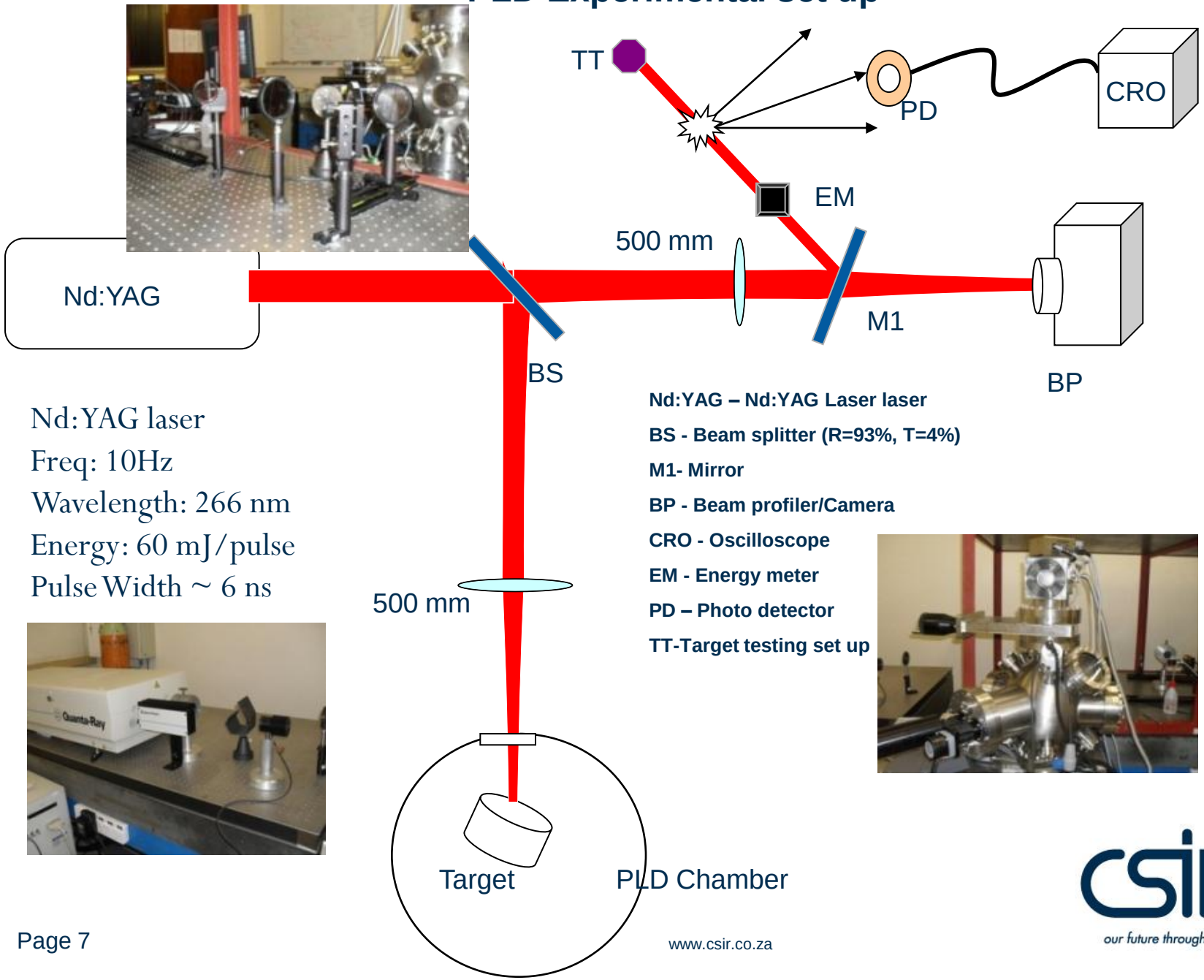
Due to their excellent properties CNTs are best candidate to be an absorbing elements in the composite



“stoichiometric transfer” makes PLD a suitable candidate for the composite growth



PLD Experimental set up



Nd:YAG laser
Freq: 10Hz
Wavelength: 266 nm
Energy: 60 mJ/pulse
Pulse Width ~ 6 ns

Nd:YAG – Nd:YAG Laser laser

BS - Beam splitter (R=93%, T=4%)

M1- Mirror

BP - Beam profiler/Camera

CRO - Oscilloscope

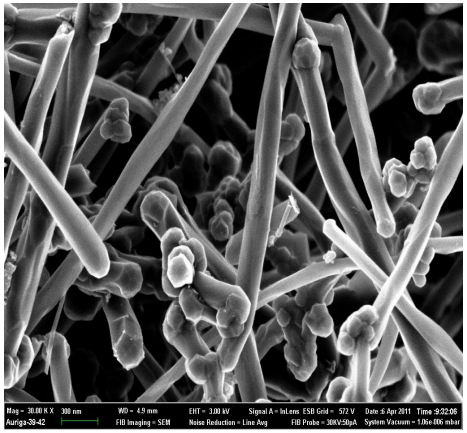
EM - Energy meter

PD – Photo detector

TT-Target testing set up

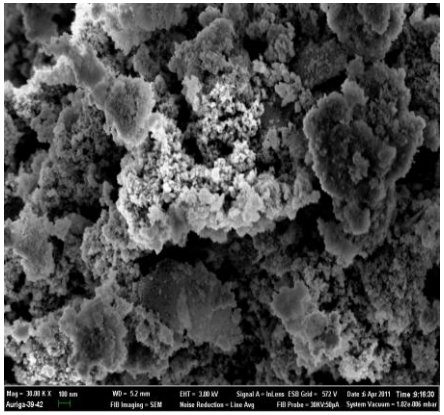
Experimental results

MWCNTs are decorated with NiO indicating successful composite formation



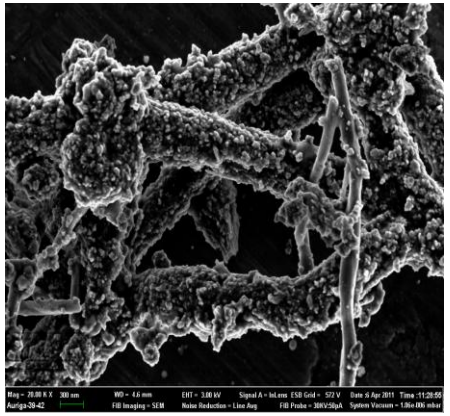
MWCNT

+



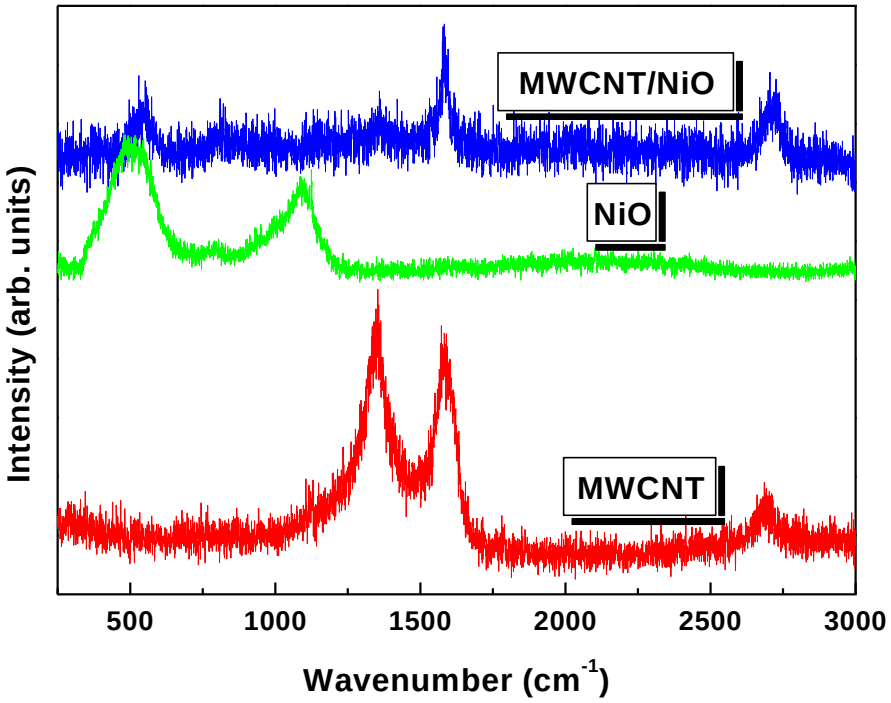
NiO

=

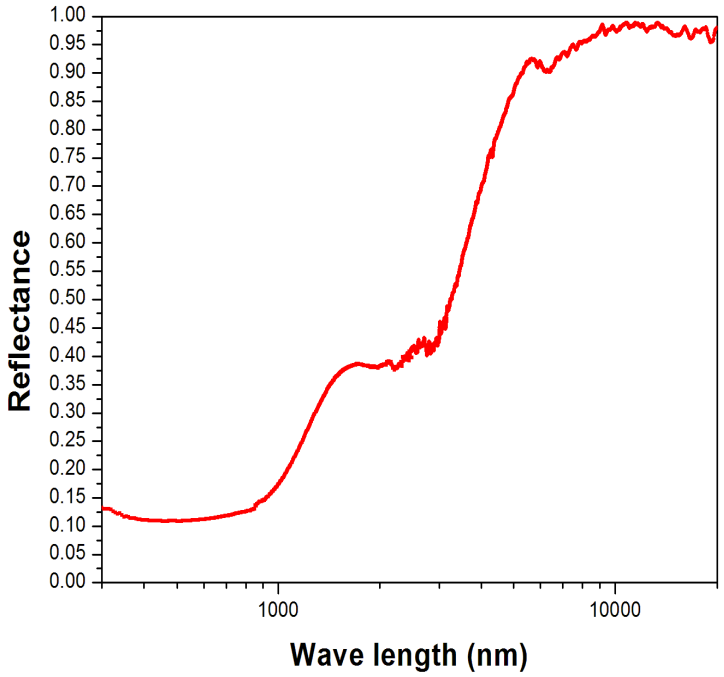


MWCNT/NiO

The new composite material exhibit new vibrational properties different from the constituents



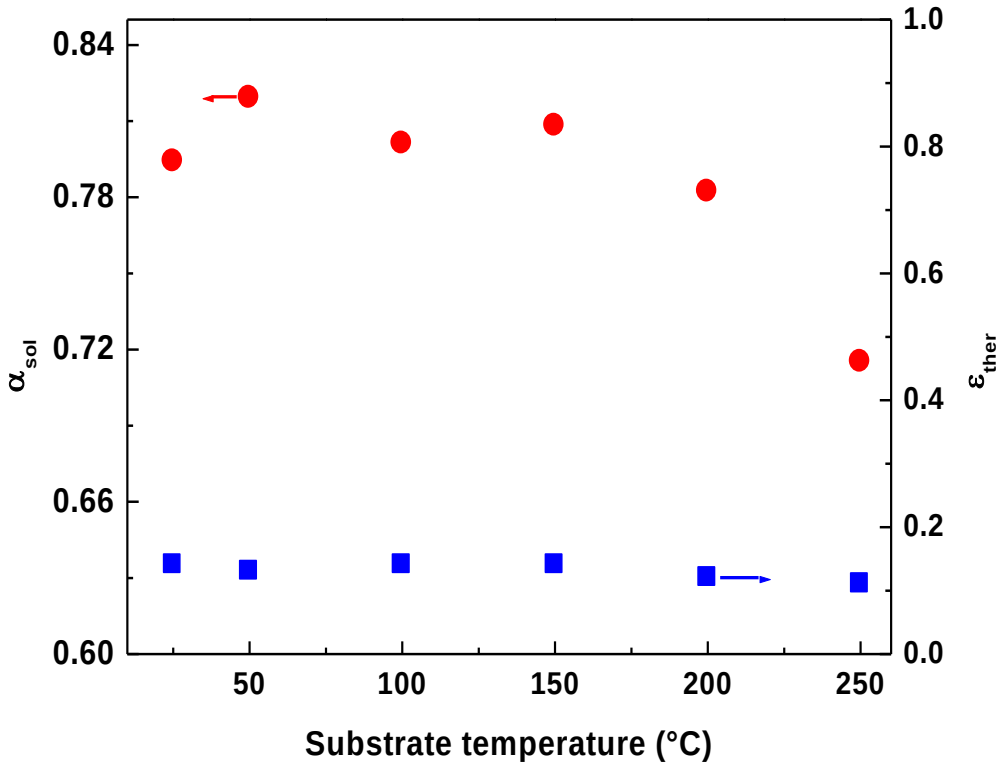
Typical reflectance spectrum shows better selectivity of our coatings



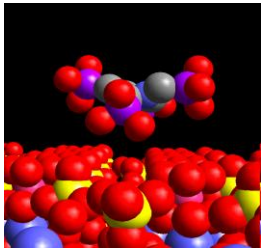
$$\alpha = \frac{\int_{0.3\mu m}^{2.5\mu m} [R(\lambda)(1-r(\lambda))]d\lambda}{\int_{0.3\mu m}^{2.5\mu m} R(\lambda)d\lambda}$$

$$\varepsilon = \frac{\int_{2.5\mu m}^{20\mu m} [R(\lambda)(1-r(\lambda))]d\lambda}{\int_{2.5\mu m}^{20\mu m} R(\lambda)d\lambda}$$

Nucleation and thin film growth

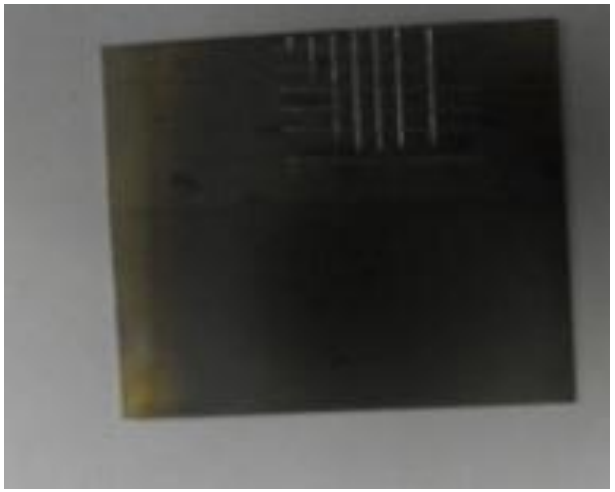


$$\alpha = k\frac{d}{\lambda}$$

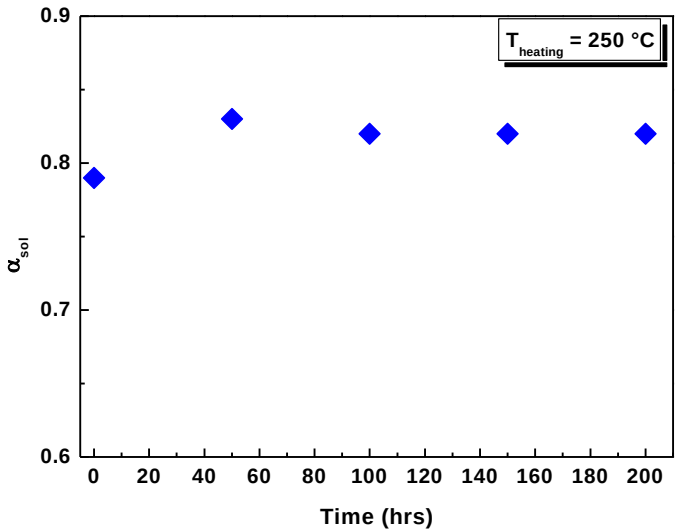


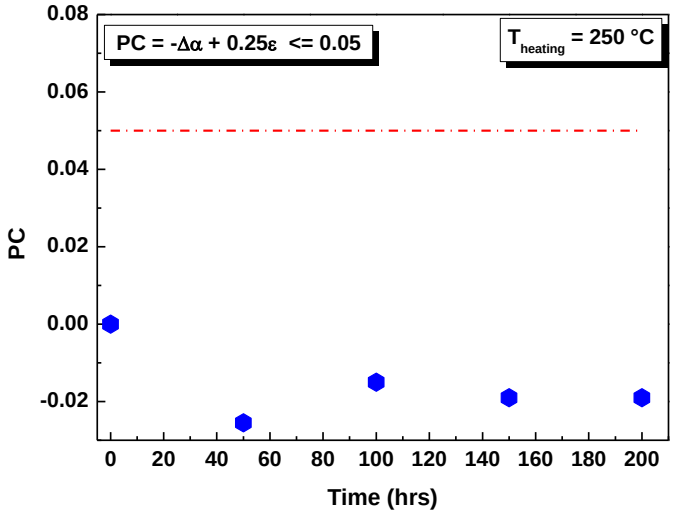
Ferguson et al.(2009) Phys. Lett rev., 256103

Our samples have shown excellent adhesion to the substrate



No change in solar absorptance suggesting our materials are promising for solar absorber application





THANK YOU!!!

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