

Carbon Nanotube Thin Film Solar Cell

Aron Cummings, Karen Krafcik, François Léonard



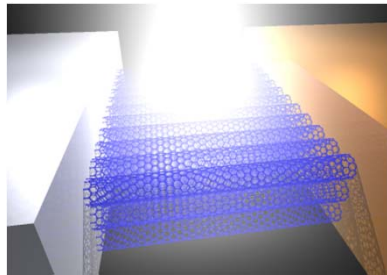
Xiaowei He, Sebastien Nanot, Robert Hauge, Junichoro Kono



Julien Varennes



Solid-state photovoltaics:
Efficient but expensive



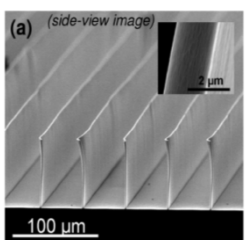
Organic photovoltaics:
Inexpensive but inefficient

Carbon nanotubes form a new class of materials for photovoltaics, between solid-state and organic materials.

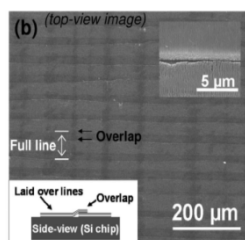
➤ Our goal is to *realize and develop a fundamental understanding* of a thin film carbon nanotube solar cell.

Experimental approach:

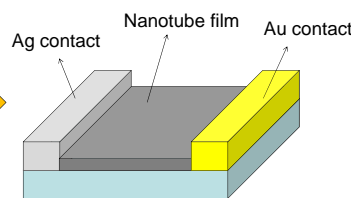
Rows of carbon nanotubes are grown by CVD:



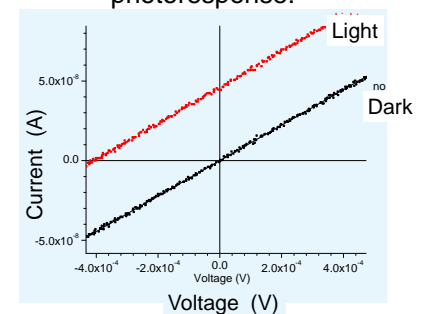
The rows are rolled over to form a thin film:



Contacts are patterned on top of the thin film:

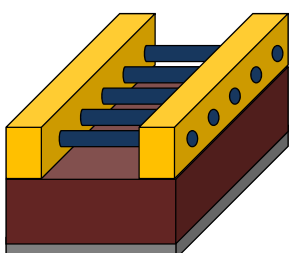


Devices show global photoresponse:



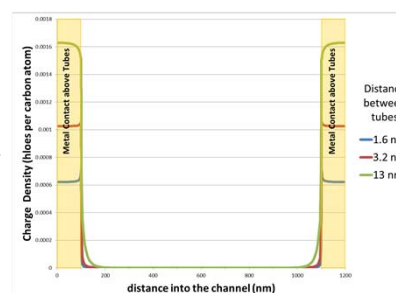
Theory and modeling:

We are exploring the properties of parallel arrays of carbon nanotubes:



We self-consistently calculate the charge and the potential along the nanotubes:

Screening increases with nanotube density:



Band alignment at the contacts also changes with nanotube density:

