Carbon-based optoelevtronics on silicon using semiconducting single wall carbon nanotubes

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Resume : Single-wall carbon nanotubes (SWNTs) are known for their exceptional physical properties ranging from mechanics to electronics and optics. These properties are expected to give rise to innovative applications, especially when nanotubes are incorporated in new functional devices. However, the conception of an effective SWNT-based electronic or optoelectronic technology faces three main concerns: the extraction of semiconducting SWNTs having the desired optoelectronic characteristics from the as-synthetized poly-disperse mixture; the deposition of high nanotube concentrations at desired areas to increases transport and optical performances and the alignment of nanotubes on the substrate. Using an effective polymer-assisted sorting approach, we obtain highly-selective separation of semiconducting SWNTs that can be coupled with optoelectronic silicon-based devices operating at the telecom wavelength of 1.5 µm. Our modified evaporative self-assembly approach can deposit concentrated SWNT networks with configurations varying from random to highly-oriented assembly. In the latter case, the obtained orientation is particularly favorable for device fabrication and operation. Several configurations enabling photo-detection and electroluminescence at the chip level are currently under investigation and the latest results will be presented. This work is funded by the European Union through the FP7 Project CARTOON (Contract FP7 -618025).