Spontaneously Aligned Single-Wall Carbon Nanotubes

Junichiro Kono

Departments of Electrical and Computer Engineering, Physics and Astronomy, and Materials Science and NanoEngineering, Rice University, Houston, Texas, U.S.A.

One of the outstanding challenges in nanotechnology is how to assemble individual nano-objects into macroscopic architectures while preserving their extraordinary properties. For example, the one-dimensional character of electrons in individual carbon nanotubes leads to extremely anisotropic transport, optical, and magnetic phenomena, but their macroscopic manifestations have been limited. Here, we describe novel methods for preparing macroscopic films, sheets, and fibers of highly aligned carbon nanotubes and their applications to basic and applied studies. Sufficiently thick films act as ideal terahertz polarizers, and appropriately doped films operate as polarization-sensitive, flexible, powerless, and ultrabroadband photodetectors. Together with recently developed chirality enrichment methods, these developments will allow us to probe, understand, and control dynamic conductivities of interacting one-dimensional electrons in macroscopic single crystals of single-chirality single-wall carbon nanotubes.

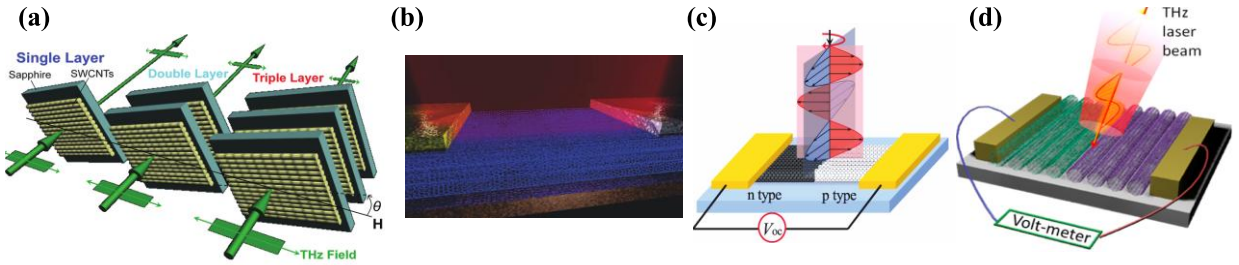

Figure 1. Optoelectronic devices based on aligned single-wall carbon nanotubes [1-6].

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