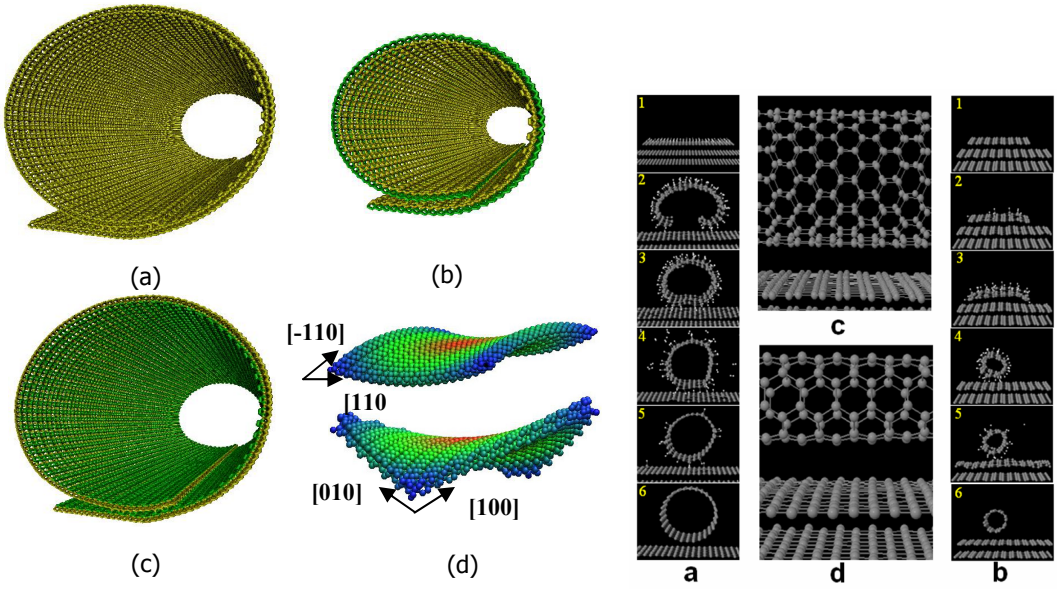
From Nanomechanical Science to Nanofabrication Technology: A New Route towards Nanotube Synthesis

Feng Liu et al., University of Utah

Supporting/Contributing Agency: DOE

Mechanical bending of thin films is a ubiquitous phenomenon impacting our daily life through household thermostat to sensors in airbags. Recently, Liu's research group at University of Utah have revealed a self-bending mechanism of nanofilms driven by atomic-level surface stress imbalance, which leads to a new approach for fabrication and synthesis of nanostructures. It is realized that the bending behavior of nanofilms consisting of a few and tens of atomic layers is both quantitatively and qualitatively different from that of macroscopic thick films. The atomic nature of the film structure and the intrinsic surface stress play a dominant role in governing the bending behavior at nanoscale. A nanofilm may self-bend by its own intrinsic surface stress without applying external stress load and its thinness leads to a large bending with the radius of bending curvature as small as a few nanometers, forming naturally a nanotube from a variety of materials. In the extreme case of the thinnest film possible, a single atomic layer of patterned graphene sheet, it leads to the development of a new method for synthesizing carbon nanotubes with an unprecedented control over their size and chirality.



References/Publications:

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Patents: U.S. provisional patent #60/908,039.