

Mechanical Properties of Nanoscale Thin Films and Membranes

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Understanding of the mechanical properties of ultrathin films and membranes is of fundamental importance and practical interest with rapidly growing nanotechnologies. However, there is a dearth of knowledge about mechanical behavior of materials at the nanometer scale, which is mainly due to the lack of reliable measurement tools. In this talk, we present a recently developed measurement technique of a combined wrinkling-cracking that enables the determination of three key mechanical properties (modulus, fracture strength and fracture strain) of the diverse classes of nanoscale thin films. This technique was further employed to address two important scientific issues: (1) confinement effects of polymer films at nanometer scale, (2) chemical durability (chlorine-induced degradation behavior) of reverse osmosis and nanofiltration membranes used in water treatment.