Materials Science of Nanoscale Structures

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I will review the factors imparting different behavior to materials with nanoscale dimensions compared to compositionally identical materials with micron-scale or larger dimensions. I will then examine capillary forces and surface mass transport from a classical point of view, and show how the description breaks down for nanoscale structures processed and operated at temperatures below the thermodynamic roughening transition temperature with implications for the fabrication and stability of nanometer-scale electronic devices. Finally I will describe the elements of a modern treatment of the energetics and mass transport on solid surfaces below the thermodynamic roughening transition temperature.

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