Fundamentals of nanotechnology

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Thermal properties

The melting temperature of a nanoparticle decreases sharply as the particle reaches critical diameter, usually < 50 nm for common engineering metals. Figure (1) shows the shape of a typical melting curve for a metal nanoparticle as a function of its diameter.

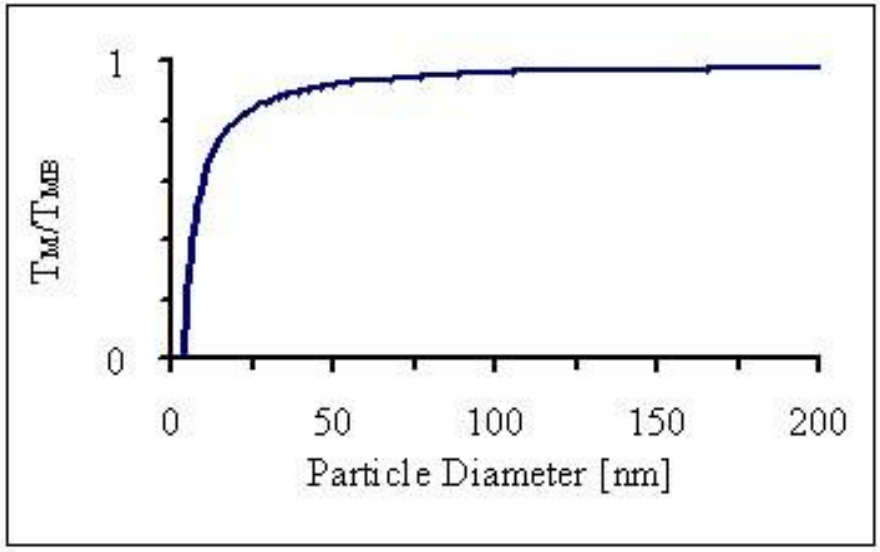

Figure (1). A normalized melting curve for gold as a function of nanoparticle diameter. The bulk melting temperature and melting temperature of the particle are denoted TMB and TM respectively. Experimental melting curves for near spherical metal nanoparticles exhibit a similarly shaped curve.

Optical properties in Nanomaterials:-

One of the most fascinating and useful aspects of nanomaterials is their optical properties. Applications based on optical properties of nanomaterials include optical detector, laser,sensor, imaging, phosphor, display, solar cell, photocatalysis, photoelectrochemistry and biomedicine. The optical properties of nanomaterials depend on parameters such as feature size, shape, surface nanoparticles.

Interaction of light with matter :

The ‘colour’ of a material is a function of the interaction between the light and the object. If a material absorbs light of certain wavelengths, an observer will not see these colours in the reflected light. Only reflected wavelengths reach our eyes and this makes an object appear a certain colour. For example, leaves appear green because chlorophyll, which is a pigment, absorbs the blue and red colours of the spectrum and reflects the green.

In general light (I) incident on a material can be transmitted (T), absorbed (A) or reflected (R):

I = T+A+R

As the size of the materials is reduced, scattering (S) of light can also contribute to its colour (or transparency).

Some nanomaterials display very different optical properties, such as colour and transparency, compared to bulk materials. In fact the key contributory factor include quantum confinement of electrical carriers within nanoparticles, this behaviour can be cleared by Plasmons phenomena.