How can the band gap be experimentally determined?

Since the absorption of light is related to the band gap, scanning of the absorption spectra of materials enables computation of the band gap. For this purpose, Diffuse Reflectance UV-Visible-NIR Spectrophotometer can be used to record spectra of solid powder or dispersions. From this spectrum, the point of inflection between high transmittance and high absorption is identified. The wave length (nm) corresponding to this point of inflection is termed as 'Absorption Edge'. (See Figure)
The band gap is calculated using the Planck's equation as follows:

$$e = h / \lambda$$

Band gap (eV) = Planck's constant / Absorption Edge (nm)

E. g if the absorption edge is, say, 356 nm, then,

Band gap = 1240/356= 3.48 eV

From this equation it is also clear that widening of the band gap in nano scale particles will result into lowering of the absorption edge.

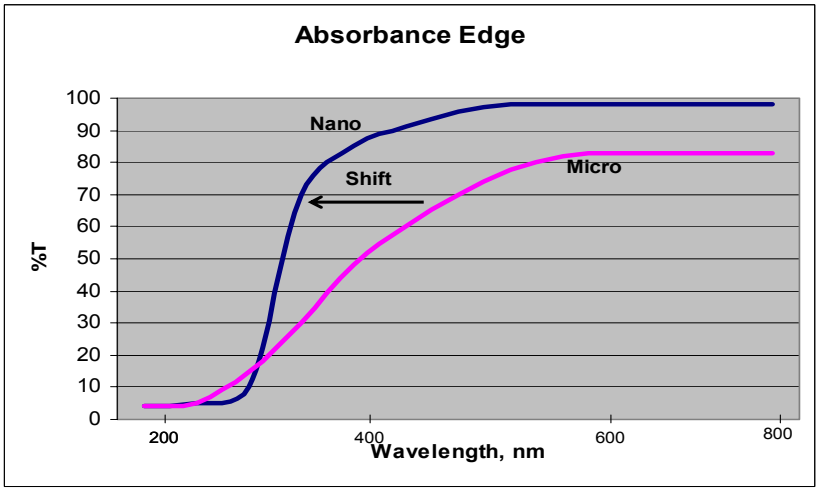

Figure: Absorption Edge and its shift from micro to nanosize
