Inverse Logarithmic Derivative Method For Determining Energy Gap And Type Of Electron Transitions As Alternative To Tauc Method

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We present a method based on Tauc equation for determining energy gap based on spectrophotometric measurements. The method has been tested on thin film TiO_2, MoS_2 and bilayer of MoS_2 / TiO_2 (Fig.1) deposited by RF magnetron sputtering. In the Tauc method, the often problem is to determine the energy gap (E_g) without knowing the nature of the optical transition described by parameter m [1]. The McLean method involves fitting the power function which may cause difficulties in the proper selection of the fitting energy range. We present a method based on the transformation of measurement data using inverse logarithmic derivative (ILD) of absorption coefficient being linearly dependent of photon energy (hν) thanks to which one can simultaneously obtain E_g and m values as a fitting parameters [2].
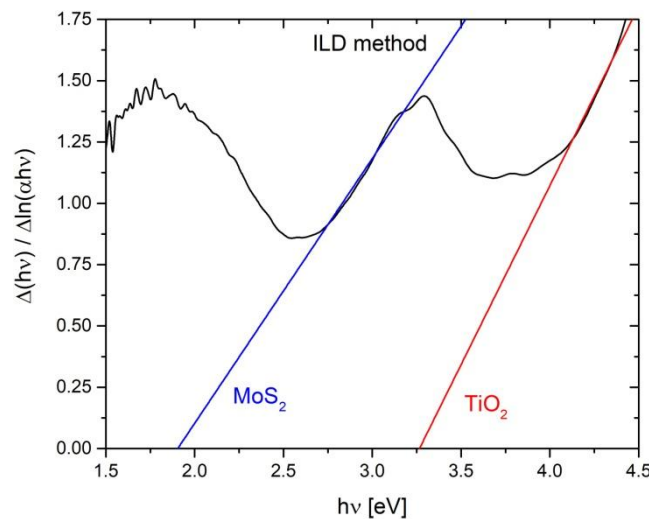
Fig.1. Inverse logarithmic derivative of αhν as a function of hν with fitted straight lines for MoS_2/TiO_2 bilayer. The slope of linear fit data give the information about m parameter whereas zero point is E_g.

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