Chapter : 3

Material Characterization Techniques

Kiran D. Diwate, Assistant professor, kiran.diwate441@gmail.com,
Phone number: 8788029974 The P.G.K. Mandal's, Haribhai V. Desai College, Pune 411002
Almas Z. Sheikh, Assistant professor, almas.zahir@rediffmail.com
Phone number: 9096545436 The P.G.K. Mandal's, Haribhai V. Desai College, Pune 411002
Manish D. Shinde, Scientist, manish.cmet@gmail.com
Phone number: 9766773287 Centre for Materials for Electronics Technology (C-MET), Pashan Road, Pune, 411008
Sadhu K. Kolekar, Scientist, kolekarsadhu@gmail.com
Phone number: 9529971357 Catalysis and Inorganic Chemistry Division, CSIR-National Chemical Laboratory (NCL), Dr. Homi Bhaba Road, Pune 411 008, India.

Abstract: *In material science thin films were mainly characterized by X-ray diffraction (XRD), field emission scanning electron microscopy (FESEM), transmission electron microscopy (TEM), atomic force microscopy (AFM), UV-Visible spectroscopy, photoluminescence spectroscopy, Raman spectroscopy, Hall measurement, resistivity measurement (four probe method) and thickness measurement etc.*

Keywords: XRD, FESEM, TEM, AFM, UV-Visible, Hall measurement, four probes
Chapter contents: Study of Material Characterization techniques such as Measurement of deposition rate, Spectroscopy techniques, Electron microscopy techniques, Electrical Measurements, Electrochemical measurements.

1.1: Measurement of deposition rate

The deposition rate or growth rate (r_d) is defined as the ratio between the accumulated thickness (in Å) of the deposited film and the time of deposition (in seconds). The thickness was measured by an electro-mechanical contact Talystep surface profilometer (see in figure 1). It consists of a stylus (~ 25 µm tip diameter) which probes the surface of the thin film and accurately measures step heights from ~ 100 Å to over 500 µm. Measurements are made electro-mechanically by moving the diamond-tipped stylus across the surface of the thin film. The stylus is mechanically coupled to the core of a linear variable differential transformer (LVDT). Surface variations cause the stylus to be translated vertically. Electrical signals corresponds to the stylus movement are produced as the core position of the LVDT changes respectively. An analog signal is proportional to the position change is produced by the LVDT, which is, in turn, conditioned and converted to a digital format through a high precision, integrating analog to