

Abstract

Scanning tunneling spectroscopy (STS) or differential conductance (dI/dV) spectrum has become an important experimental method to study density of states (DOS) of semiconductors. Due to its localized nature of measurement in its extreme, the spectroscopy can be applied to semiconductors also in their lower-dimensional forms. The STS yields DOS at the point of measurement as a function of energy. That is, dI/dV spectrum allows derivation of energy levels at that particular point of a semiconductor. dI/dV images recorded at select voltages in addition allows one to “see” the materials energetically. Such a nature of imaging hence allows energy-mapping of domains in heterojunctions and complex nanostructures due to dissimilar DOS intensity of the constituent semiconductors at the voltage of imaging. We will discuss some differential conductance images in complex nanostructures, such as pn-junction nanorods and P3HT:PCBM bulk-heterojunctions. Band-diagram of a range of heterojunction solar cells constructed through this technique will also be discussed.