

Spectroscopic Investigations of Point Defects in Functional Nano-materials

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Abstract:

Electron paramagnetic resonance (EPR) is a very powerful method due to its enhanced sensitivity to unpaired electrons. In order to understand the defect structure in functional nano-materials we use multi-frequency EPR spectroscopy. In this presentation i) basics of EPR spectroscopy, ii) quantum confinement effects in ferroelectric nano-materials and iii) EPR and Photoluminescence (PL) investigations of intrinsic defect centers in semiconductor zinc oxide (ZnO) quantum dots will be given.

Starting with the introductory information about EPR spectroscopy; poling, aging, doping and nano-size effects will be discussed for the ferroelectric materials such as, PbTiO₃, BaTiO₃, PbZrTiO₃ (PZT) etc. In the last part of the talk, surface and core defects and their reactivity under temperature and light will be presented for ZnO semiconductor quantum dots. Defect models will be discussed. Metal ion doping of ZnO nanomaterials will be presented through the application of diluted semiconductor materials (DMS) that have high potential in spintronic devices.