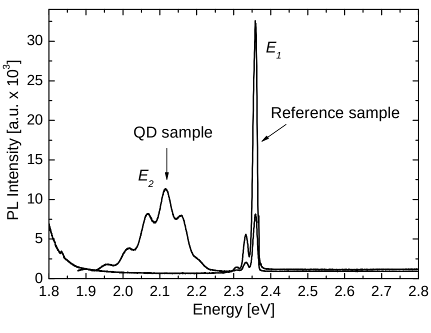
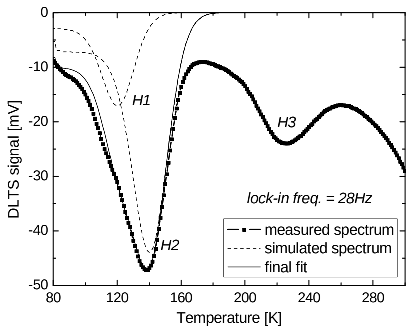
Electro-optical characterization of Ti/Au-ZnTe Schottky diodes with CdTe quantum dots

E. Zielony[1], E. Płaczek-Popko[1], P. Nowakowski[2], Z. Gumienny[1], A. Suchocki[2] and G. Karczewski[2]

[1]Institute of Physics, Wroclaw University of Technology, Wybrzeze Wyspianskiego 27, 50-370 Wroclaw, Poland
[2] Institute of Physics, Polish Academy of Sciences, al. Lotnikow 32/46, 02-668 Warsaw, Poland

We present the electric and optical spectroscopy techniques that have been applied to investigate ZnTe (*p*-type) – Ti/Au Schottky diodes containing a layer of CdTe self-assembled quantum dots (SAQDs). The reference ZnTe – Ti/Au diode without dots was also studied for comparison. Both samples were grown by molecular beam epitaxy technique. Raman measurements confirmed the presence of the CdTe layer while the photoluminescence (PL) spectra proved that CdTe quantum dots were formed in the investigated structure. The PL spectra revealed the CdTe QD electron-hole recombination energy equal to 2.1 eV at 10 K. Based on the temperature PL measurements the activation energy of photoluminescence quenching has been determined to be equal to 22 meV. Further confirmation for the QD formation has been obtained from the C-V characteristics which exhibited a step related to the charge accumulation at the QD states. DLTS spectra for the sample with QDs yield three hole-related signals with apparent activation energies equal to $E_{H1} = 0.16$ *eV*, $E_{H2} = 0.2$ *eV* and $E_{H3} = 0.4$ *eV*. For the reference ZnTe-Ti/Au diode solely single signal was observed of signature close to the level *H3* in the QD sample. Detailed characterization of the traps as well as the PL studies lead to the conclusion that the level *H2* is related to the defects located close to the QDs created during the growth while the other traps are associated with defects present in the ZnTe bulk material.





[1] E. Zielony, E. Płaczek-Popko, P. Nowakowski, Z. Gumienny, A. Suchocki and G. Karczewski, *Mat. Chem. Phys.* **134**, 821-828 (2012).

[2] E. Placzek-Popko, E. Zielony, J. Trzmiel, J. Szatkowski, Z. Gumienny, T. Wojtowicz, G. Karczewski, P. Kruszewski, and L. Dobaczewski, *Physica B* **404**, 5173 (2009).