Illumination Intensity Spectra of semiconductors junction

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The paper presents model results compared with experimental study of open circuit voltage spectra as a function of illumination photons number.
The value of open circuit voltage is determined by the change of quasi Fermi energy levels created at the opposite sides of junction. The carriers concentration change leads to the change of quasi Fermi energy levels at the sides of the junction. The difference of the quasi Fermi energy levels created at the conduction band (electrons cell) contribute together with the difference at the valence band (hole cell) to create total open circuit voltage [1]. These spectra are predicted by model and will be compared with correlated experimental results.
In experimental conditions the sample was illuminated by stable intensity laser beam. The number of photons illuminating the sample was regulated by chopper opening time. The general shape of experimental and predicted spectra fits together. Obtained experimental spectra depend on junctions preparation technology conditions. The measured spectra are strongly disturbed by the kind of "defects" (e.g. impurities, barriers, bands offset, clusters) located at the junction region. The quasi Fermi energy levels position can be strongly disturbed by the "defects" reducing minority carriers concentration. The proposed model can be well applied to study nanostructure junctions (plane or wires like) with application of electron beam (ebic) technique.
Proper choice of energy hν of illumination allows to generate carriers n = p in semiconductor of only one side of heterojunction and it allows to create different relative change of the density of minority and majority carriers in only one side of junction. It allows to estimate contribution of this side of heterojunction to the measured open circuit voltage. The experimental study of intensity spectra illustrate the effect as well for minority n type as for p-type cells of nano plenary heterojunctions for ZnTe (p)/CdTe (n) [2]. The experimental spectra performed for silicon p-n nano plenary homojunction showed remarkably different structure of spectra obtained for crystalline surface and not crystalline surface of the sample.

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