Minority Carriers Spectra in Photovoltaic Heterojunction

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The paper describes model of photovoltage generation in semiconductors photovoltaic heterojunction [1,2]. This is based on the fundamental effects, how the carriers chaotic movement energy can create ordered photovoltaic effect. This effect of carriers entropy decrease is caused due to different relative change of semiconductors minority and majority carriers density obtained under proper heterojunction illumination. The correlations between the changes of basic parameters: minority and majority carriers concentration, Quasi Fermi levels, and corresponding to it change of photovoltage are presented. In photovoltaic effect the change of carriers concentration leads to corresponding change of quasi Fermi levels and it leads to the change of measured photovoltage value. The changes of carriers quasi Fermi levels at the opposite side of heterostructure are different for the same carriers electrons or for the holes. These differences of the quasi Fermi levels contribute to the value of generated photovoltage [2]. 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 states for minority and majority carriers. It allows as well to estimate contribution of both side of heterojunction to the measured photovoltage. The illumination intensity spectra of photovoltage are obtained as a continuous curves, due to continuous scan of quasi Fermi levels of minority carriers in related band gaps. The defect states of the band gaps disturb continuous scan of minority carriers quasi Fermi level. The photovoltaic intensity spectra allow to estimate energy position of the defect states related to the minority carriers. This will help to recognize and exclude parasitic defects of heterojunction. For general theoretical description the main set of equations [3] can be used.

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