**A MODIFICATION IN THE DETAILED BALANCE MODEL FOR QUANTUM DOT NANOCRYSTAL SOLAR CELLS**

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| **Abstract**  The detailed balance model, developed by Shockley and Queisser [1], has been an important model in order to calculate an upper limit for the conversion efficiency of silicon p-n junction solar cells. The model has provided an important motivation to scientists studying energy and related topics in improving the conversion efficiency of solar cells. Recently, the model is also used in the calculation of conversion efficiencies for new-generation nanocrystal solar cells [2-4]. The original model was developed depending only on the band gap energy (Eg) of the electroactive material of solar cells, and hence, even if the active materials are different, if they have the same Eg, the conversion efficiency values become the same [5]. In this study, the original recombination current density expression has been modified for more realistic conversion efficiency calculations [6]. In the modified model, the recombination current density includes not only the Eg, but also various parameters such as effective mass and dielectric constant in the calculations via oscillator strength. Thus, more realistic efficiency values are obtained for different materials, even if they have the same Eg. The obtained results were compared with the experimental data like open circuit voltage, and it was observed that the results are in better agreement with experiments than the results of the original model. |
| Keywords: Quantum dot solar cells, Shockley and Queisser limit, Detailed balance model, 3rd generation solar cells |

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