Implementation of Perovskite model in Transfer Matrix modelling method, and analysing the performance of Organic and Perovskite solar cells in response to changing their structural properties

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The excessive use of fossil fuels and consequently the reduction of resources and the high pollution of the environment, prompt humans to seek energies which don’t have the mentioned disadvantages. Therefore, humans sought after renewable energy sources, such as solar, wind, waves and so on. One way to employ solar energy is to manufacture and use solar cells. A solar cell is a device that convert solar energy into electrical energy using photovoltaics effect. In recent years several generations of solar cells have been developed. There are different types of solar cells, such as silicon solar cells, dye-sensitized solar cell, quantum dot solar cells, organic solar cells and perovskite solar cells. In recent years much attention has been paid to perovskite solar cells. Perovskite solar cells are one of the new types of cells which have both low manufacture cost and simpler manufacture process compared to the minerals. In this thesis, modeling and simulation of perovskite solar cells are studied. Simulations were carried out using transfer matrix method and coding was done using MATLAB. The distribution of the electric field in the structure, as well as the amount of light absorption and carrier generation, and the short-circuit current, have been calculated for Perovskite solar cell. To optimize the structure, the thickness of the Perovskite material that is active is changed and the corresponding short-circuit current is calculated. Comparing the results with the results of organic based solar cells shows that the Perovskite solar cell has better results.

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Method