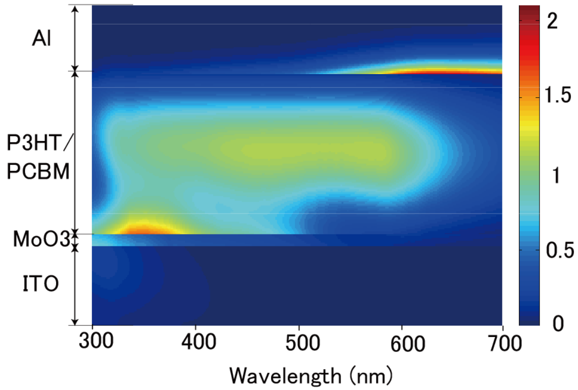
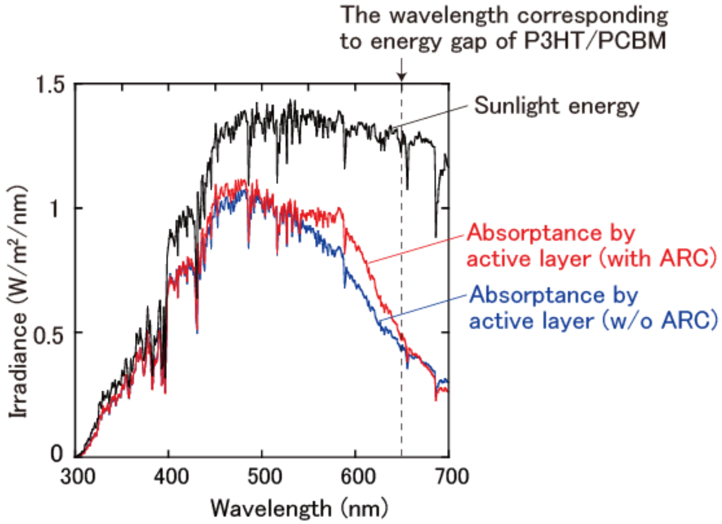
Design Methods of the Antireflection Coating for Solar Cells

Associate Professor Shigeru Kubota



Absorptance distribution in the solar cells



Changes in the absorption spectrum by ARC

Content:

To improve the power generation efficacy of solar cells, this study aims to develop its optical analysis method by using the thin-film matrix method and finite-difference time-domain (FDTD) algorithm.

The optical matrix method can find the solutions of the Maxwell's equations, which satisfy the boundary conditions as well as the optical properties of the materials, by linearly summing the harmonic plane wave solutions. By combining the matrix method with an adequate optimization algorithm, this research explores an efficient design scheme for robust antireflection coating (ARC) of solar cells, which can take into account the manufacturing errors in the thickness of each thin-film layer within the photovoltaic cells.

The FDTD method is the one to directly integrate the Maxwell's equations and this method can be applied to the solar cells incorporating a variety of ARC including the surface nanostructure.

This study particularly aims to develop a simulator to design the ARC of organic solar cells (e.g., P3HT/PCBM-based cells) efficiently by using lower computational power provided by PCs.

Yamagata University Graduate School of Science and Engineering
Research Interest : Mathematical Engineering,
Computational Neuroscience

E-mail : kubota@yz.yamagata-u.ac.jp
Tel : +81-238-26-3766
Fax : +81-238-26-3240
HP : http://systemsosei.yz.yamagata-u.ac.jp/staff.html