Silicon quantum dots and perovskites hybrid solar cells

研究の目的

Formamidinium Lead Iodide (FAPbI₃) perovskite (PK) limiting of thermally unstable methylammonium (MA).

◆ The performance of PK with FAPbI₃ the fs laser engineered silicon quantum dots (SiQDs) increased initial solar cell performance.



• Initial SiQDs were prepared by electrochemical etching.

• fs laser treatment of SiQDs in colloidal solutions resulted into well separated SiQDs, better interaction with host PK matrix J. Phys. Chem. C 2016, 120, 33, 18822, Nanoscale Adv., 2019,1, 4683

The role of SiQDs in PK solar cell stability.







+ Hybrid solar cells based on SE SiQDs in limiting of thermally unstable methylammonium in formamidinium lead iodide (FAPbI₃) perovskites.

• Characteristics of SE SiQDs / FAPI₃ hybrid films * The introduction of the SE-SiQDs does not impact the morphology, film thickness, energy gap. * The PL is quenched indicates that the radiative recombination is reduced possibly due to lower defects in the film. * Fermi level shifts (n type, negative built-in charges in SE-SiQDs).

• Characteristics of SE SiQDs / FAPI₃ hybrid solar cells (SCs) * SE SiQDs increase the overall power conversion efficiency SCs (~ 2 % in average). * Improved device stability not enough (pronounced degradation in humid chamber)



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