Theoretical studies on a new pattern of laser-driven systems: towards elucidation of direct photo-injection in dye-sensitized solar cells

KENJI MISHIMA, KOICHI YAMASHITA, The University of Tokyo — We theoretically and numerically investigated a new type of analytically solvable laser-driven systems inspired by electron-injection dynamics in dye-sensitized solar cells. The simple analytical expressions were found to be useful for understanding the difference between dye excitation and direct photo-injection occurring between dye molecule and semiconductor nanoparticles. More importantly, we propose a method for discriminating experimentally dye excitation and direct photo-injection by using time-dependent fluorescence. We found that dye excitation shows no significant quantum beat whereas the direct photo-injection shows a significant quantum beat.

1This work was supported by Funding Program for World-Leading Innovative R&D on Science and Technology (FIRST) “Development of Organic Photovoltaics toward a Low-Carbon Society,” Cabinet Office, Japan.