Project title **and acronym (if any)**	Mechanisms of Protection from Light in Single Cell Algae During Photosynthesis
Project web site (if any)	
Funding organization(s)	National Institute for Basic Biology, Okazaki, Japan
Project no	FHD-2015-8094
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Project team	M. Orkun Çoruh
Budget	7.199,18 (TL)
Start-finish date	02.10.2015 – 26.04.2016

Project summary

Chlamydomonas reinhardtii is accepted as a model organism in biological research due to the easiness of it culture and genetic manipulation. It is used in a variety of areas from genetics, photosynthesis, evolution, bio-pharmaceuticals production, hydrogen production to cell movement, responce of cells to light, cell recognition mechanisms and cell responce to variation of mineral nutritients. Research of photosynthesis is one of the most important research areas that model algae is used. Photosynthesis is basically the process of conversion of sunlight to energy for survival. Particularly, it causes the energy of visible photons to be stored. In this context, it is possible to relate it to solar cell technology. Indeed, "Dye Sensitized Solar Cells" developed by M. Graetzel in 1991 were inspired by photosynthesis and seperated the "light harvesting" and "charge seperation" processes that were combined in the conventional semiconductor solar cells. For that purpose, molecular structures similar to chlorophyll molecules were used for light harvesting. The research about mica-titania pearlescent pigments, which was diversified by four thesis resulted in clues to use these pigments in a new type of solar cell. In this project, the aim is to discuss and gain the laboratory experience about photosynthesis mechanisms in model algae, investigation of these mechanisms and screening of current situation in this research area, understanding of light protection mechanisms. To this aim, three mutants of chlamydomonas reinhardtii were cultured, grown in different light conditions and their photosynthetic efficiencies were measured by PAM fluorimetry and compared. Their efficiencies were related to photoinhibition under high light conditions.

Scientific, technological, economic and social gains obtained or expected by the project

As a result of this project, interrelation between different light protection mechanisms was searched, in addition the probability of employing/mimicking these mechanisms for increasing the stability and efficiency of solar cells was discussed.

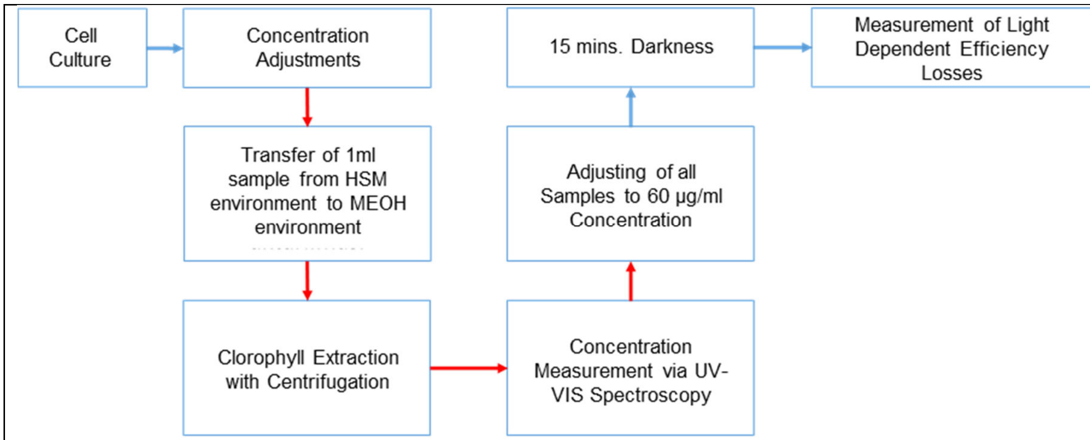
State transitions depend on the replacement of some of the light absorbing molecules. This replacement occurs in responce to the activity of a protein and is used for balancing the light absorption of photosynthetic components. This mechanism could find potential usefulness in the design of mobile photovoltaic componentswith UV protection abilities. Besides that replacement of dye molecules from shadowed areas of cell to unshadowed areas can enhance efficiency too.

Circular electron transfer is a mechanism to use the excited electrons as a parameter enhancing the proton gradient in the cell. In this case, enegy of excited electron is used not for electron transfer, but for other functions. With this way, excess energy is given as heat and also chemical balance is provided. This mechanism could be used in PV for transferring the excess energy to meta stable crystal defects in order to transform them into stable forms that do not interfere with electron transfer.

Besides, reactive oxygenic species could be controlled and may be used for other functions via the creation of proton and electron gradients inside the cell. This could be beneficial in controlling the molecular species that shorten the life of solar cells.

Publications derived from the project

Figures and images related to the project


Cell Culture
Concentration Adjustments
Transfer of 1ml sample from HSM environment to MEOH environment
Clorophyll Extraction with Centrifugation
Concentration Measurement via UV-VIS Spectroscopy
Adjusting of all Samples to 60 µg/ml Concentration
15 mins. Darkness
Measurement of Light Dependent Efficiency Losses