

**【Grant - in - Aid for Scientific Research on Innovative Areas(Research in a proposed research area)】**  
**Interdisciplinary Area**



**Title of Project : Creation of novel light energy conversion system through elucidation of the molecular mechanism of photosynthesis and its artificial design in terms of time and space**

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Research Project Number : 17H06433

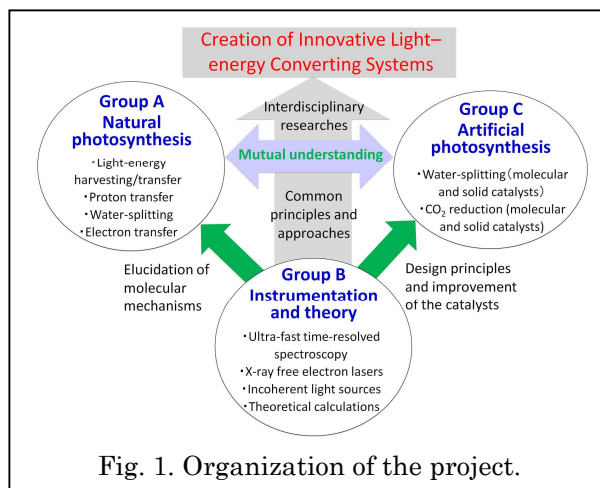
Researcher Number : 60261161

**【Purpose of the Research Project】**

The energy required for almost all life activities on the earth depends on the light energy from the sun, which is converted into biologically useful chemical energy by the process of photosynthesis. Photosynthesis also produces molecular oxygen that is indispensable for aerobic lives on the earth. The aims of the present project are to elucidate the principles of natural photosynthesis at the molecular and atomic levels and, with the aid of these principles, to develop various artificial photosynthetic systems for the production of hydrogen fuels and organic molecules from water and CO<sub>2</sub> using visible light. These researches will be conducted in a strongly interdisciplinary approach involving various fields such as biology, biochemistry, biophysics, molecular biology, various fields of chemistry including inorganic, organic, synthetic, coordination, theoretical chemistry, advanced photonics, engineering, etc. The results of these studies will significantly contribute to the acquisition of clean, renewable energy from the sun, which will be important for mitigating the problems of energy-shortage and global warming, two important issues that our society is facing, or will face in the near future.

**【Content of the Research Project】**

Researches in this project include three groups: (A) Elucidation of the principles in natural photosynthesis; (B) Studies on the common mechanisms of natural and artificial photosynthesis by means of advanced photo-physical measurements and theoretical analyses; (C) Development of various artificial photosynthetic systems that may use visible light from the sun to synthesize hydrogen fuels and/or useful organic compounds from water and/or CO<sub>2</sub>. Each group will include 2-3 pre-designed teams focusing on some specific topics as illustrated in Fig. 1. There will also be budgets devoted to studies selected from individual researchers on each of the related topics.



**【Expected Research Achievements and Scientific Significance】**

Elucidation of the principles of natural photosynthesis is not only important for the photosynthesis research, but may also provide important clues for the development of artificial photosynthetic systems, which may enable us to synthesize hydrogen fuels and useful organic compounds from water and CO<sub>2</sub> using visible light from the sun.

**【Key Words】**

Natural photosynthesis: The process that produces sugars and molecular oxygen from water and CO<sub>2</sub> using light-energy from the sun, which is performed by various photosynthetic organisms.

Artificial photosynthesis: Processes that utilizes light to split water and/or reduce CO<sub>2</sub> to produce hydrogen and organic compounds artificially.

**【Term of Project】** FY2017-2021

**【Budget Allocation】** 1,146,100 Thousand Yen

**【Homepage Address and Other Contact Information】**

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