## ABSTRACT

Photovoltaic technology, that converts sunlight to electricity, is a potential energy alternative to solve the future energy problem. The discovery of dye-sensitized solar cell (DSSC) based on titanium dioxide ($TiO_2$) by Oregan and Grätzel in 1991 with an efficiency of 11% gives a very promising breakthrough in the field of solar cells. It is inexpensive to prepare, environmentally friendly, and the light-weight thin-film structures are compatible with automated manufacturing (Grätzel, 2005). Despite offering relatively high conversion efficiencies for solar energy, typical dye-sensitized solar cells suffer from durability problems that result from the use of organic compounds as dye-sensitiser and liquid electrolytes. Consequently, it adversely affects long-term performance and durability.

This research proposes to develop an energy renewable source technology based on solar energy as the implementation one of the university ground research theme as stated in the Master Plan Research UNY. Kompleks N719, phorpyrine, CdS and $ZnO_2$ are use to sensitize N-$TiO_2$, while 2,2',7,7'-tetrakis(N,N-di-p-methoxyphenyl-amine)9,9'-spirobifluorene (spiro-OMeTAD) will be used in the system as hole transport material. Basically the research aims to improve the power conversion efficiency of the solid state dye-sensitized solar cell device based on nitrogen doped $TiO_2$ (N-$TiO_2$). Nitrogen doping on $TiO_2$ (N-$TiO_2$) will allow the material to absorb a broad range of light energy, including energy from the visible region of the electromagnetic spectrum. This work focuses on the photovoltaic performance of SSDSC using diverse light absorbing materials, especially high extinction molar of ruthenium complex and quantum dot semiconductors. The first year research have resulted an optimum N-$TiO_2$ relating to the requirement as semiconductor at DSSC system. Some quantum dot semiconductor such as CdS, CdSe, PbS, PbSe, ZnS and ZnSe have been evaluated as sensitizer and showed great improvement in light absorbing property.

The target of the second year research are developing the solid state solar cells with the use of solid electrolyte applied in studied system from the first year. It also targets at least one journal international each year and one intellectual property rights at the end of the research. In addition, through this research it also expected to elaborate a mutually network and cooperation with Sun Yat-sen University for future research elaboration especially at solar cells field. Overall, the results of this research are expected to contribute to the sunlight utilization technology as a source of renewable energy. More specifically, this research is also expected to increase the participation of Universitas Negeri Yogyakarta in support of technology and national development.