

## ABSTRACT

Entering the 21st century, supplies of primary energy (oil and gas) depleting, while increasing energy needs. One solution to overcome this problem is to optimize renewable-energy sources. In Indonesia, a potential source of renewable energy is solar energy. Tools used to convert the sun's radiant energy into electrical energy, commonly known as photovoltaic panels or solar cells. Photoelectrochemical solar cells are developed, one of them dye-sensitized solar cell (DSSC). In manufacturing solar cells do not require material with a high-purity level. DSSC which has been developed using  $\text{TiO}_2$  as a semiconductor material. The highest efficiency using  $\text{TiO}_2$  semiconductor layer by 11%.  $\text{TiO}_2$  be an option from the semiconductor layer due to  $\text{TiO}_2$  is a material that is relatively inexpensive, non-toxic, and available lots in nature. However,  $\text{TiO}_2$  has a wide bandgap (3.2 eV-3.8 eV). Besides pure  $\text{TiO}_2$  has a small absorption efficiency, by 5%. Therefore, it is necessary efforts to improve the efficiency of solar cells made of  $\text{TiO}_2$ . This study has been conducted on the provision of dopant  $\text{TiO}_2$  layer and the metal insert in the space between the  $\text{TiO}_2$  particles. Provision of dopant on the  $\text{TiO}_2$  layer using  $\text{CuO}$  as an addition to the spectrum material absorption and the addition of the metal in the space between the metal particles using copper (Cu) as a result of excitation of electron transport enhancer  $\text{TiO}_2$ .  $\text{CuO}$  material used is made of a simple wet chemical method, with 0.2 M  $\text{Cu}(\text{NO}_3)_2 \cdot 3\text{H}_2\text{O}$  and precursors  $\text{NaOH}$  with a variety of molarity (0.5 M, 0.75 M and 1.5 M). The Insertion of Cu using electroplating method with the source voltage or current source. The results showed that the influence of the  $\text{CuO}$  precursor molarity generated affects the purity and the shape of the  $\text{CuO}$ , and obtained the best molarity as forming  $\text{CuO}$  was 0.75 M  $\text{NaOH}$ . Make optimum efficiency of solar cells by 0, 029%  $\text{TiO}_2$  obtained by the addition of 1.8%  $\text{CuO}$  dopant. 10x increases in efficiency of solar cells are optimum worth of 0.352% obtained by adding copper metal particles using a source current of 10 mA for 120 seconds when electroplating.

**Keywords:** solar cell,  $\text{TiO}_2$ , precursor  $\text{NaOH}$ , simple wet chemical method, spray method, electroplating method.