Pigment driven solar battery

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Experiment background

Dye-sensitized solar cells are composed of TiO_2 baked on glass after which one side is inserted in a pigment while the other side of the glass is coated with positive electrode carbon.

Advantage
- Materials are cheap.
- Easy to create various shapes.

Disadvantage
- Difficult to use it for a long time.
- Power generation efficiency is poor.

The purpose of the experiment

We will focus on pigments and the changes in power generation due to anthocyanin content. We will also examine the minimum amount of anthocyanin required for power generation.

Materials and Method

- Materials and Tool

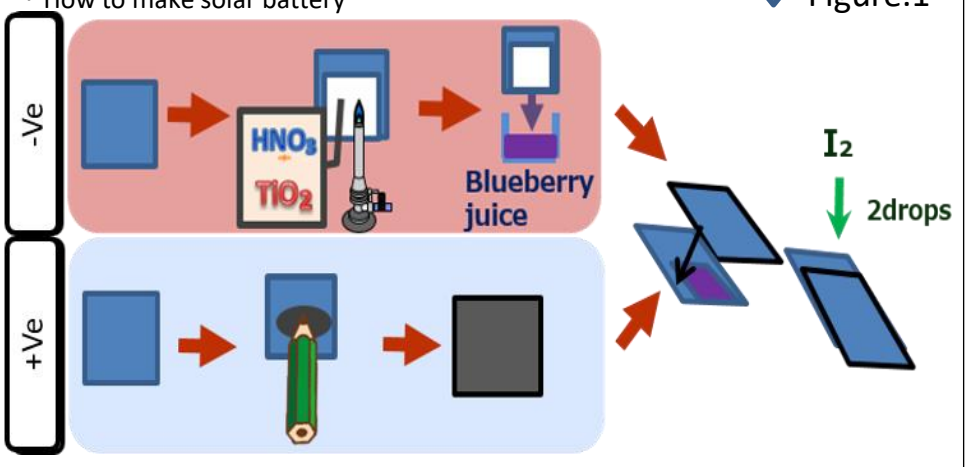
  Solar battery…Conductive glasses, HNO_3, TiO_2, C, H_2O, I_2,
  Blueberry juice(100%, 50%, 25％),
  Strawberry juice(100％)

  Tool…Gas burner, Projector, Digital multimeter

※Blueberry juice100%→6 blueberries and pure water(2mL)

- How to make solar battery

Figure.1



Experiment

①We investigated the difference in the amount of power generated by fruit juice.

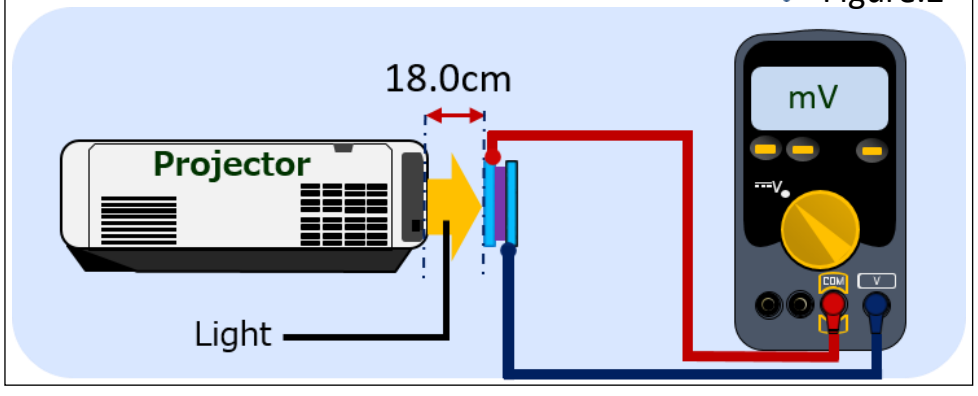
②We investigated the difference in the amount of power generated by the amount of anthocyanin added.

Method

①We make solar battery using blueberry juice or strawberry juice.

②We make solar battery using blueberry juice in different concentrations (100%, 50%, 25%).

Figure.2



References

Sendai Daisan Senior High School:
"pH level of HNO_3 and Dye-sensitized solar cells"
Kenis:Nanocrystal Dye-sensitized solar cells making kit

Results

Figure.3(Dye dependence)

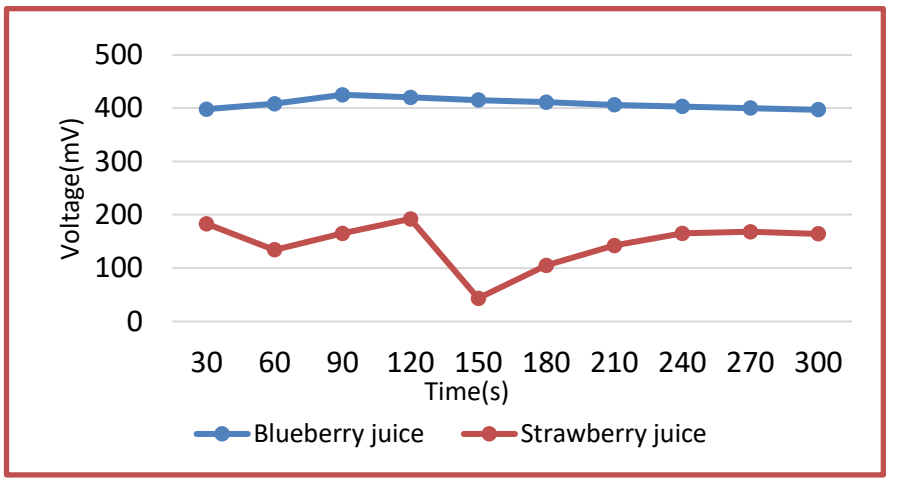
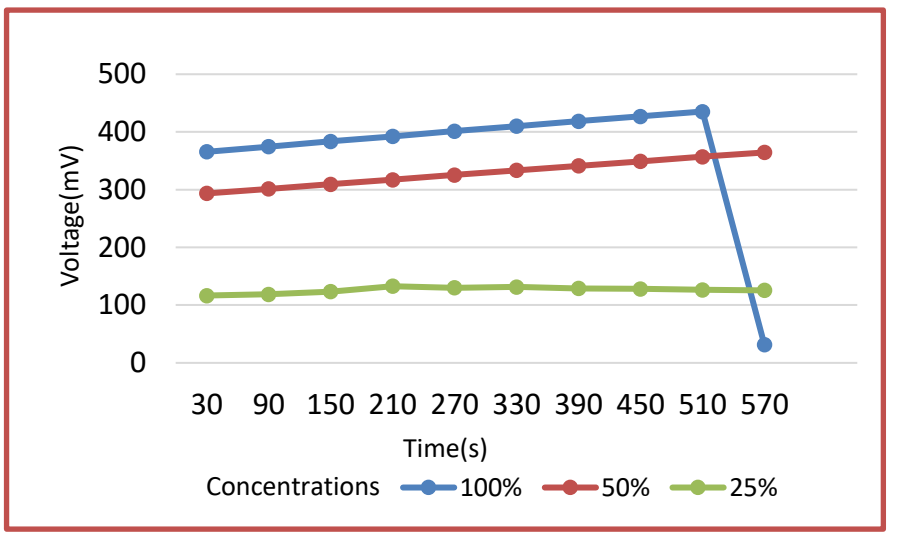


Figure.4(Concentration dependence of blueberry)



Discussion

Experiment①
- The battery with blueberry juice had a higher voltage.

Experiment②
- The battery with high concentration fruit juice had a higher voltage.

The amount of pigment contained in the blueberry juice is larger.

Summary

From Experiment①, we thought that when the amount of pigment contained in the juice is large, there is increase in power generation.

From Experiment②,we thought that when the pigment concentration in the juice is high, there is increase in power generation.

Future work

- We will make an experiment using blueberry juice concentrations (100%, 50%, 25%) again.
- We will make an experiment using blueberry juice concentrations (12.5%, 6.25%, 3.125%).
- We will measure anthocyanin content of each of the blueberry juice concentrations(100%, 50%, 25%, 12,5%, 6,25%, 3.125%) using Absorbance measuring instrument.