The quality of Japanese water

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2.1 Abstract

The purpose of our research is to find out a new way of making cleaning water. In Japan, most people are able to get clean and safe water because Japan has a reliable method of cleaning water. However, in other developed countries, methods for reliably making clean water has not yet developed yet. This is when one question came in our mind. "Why is the quality of water so high in Japan?" "What is the best way to make clean water?" To find the answer to these 2 question, we decided to find out the quality of various water in Japan. To do so, we conducted BOD (Biochemical Oxygen Demand) experiments. From the result of our experiments we found that the there were a high possibility that the quality of water is influenced by how these water comes.

From now on we're going to continue to conduct the experiment of BOD and find out whether our consideration for the result is correct. Because our data is insufficient, there's a possibility that the data has some error. So we're going to reduce the error by conducting as many experiments as possible.

2.2 Keywords

BOD, Quality, Tap, Snow, Spring Water

2.3 The purpose of the research

In the world, there are a lot of people who need clean water. For example, according to the information of United Nations, about 6 hundred million people are not supplied water lifelines. We think this is a really big problem in the world and we thought that we want to study method of producing clean water to help people in need. Therefore, the purpose of this study is to find new way of cleaning water.

Most of the people those who need water live in areas of Africa and South East Asia because those areas have little precipitation and these areas have not been supplied with water lifelines. The population in China have been increasing so rapidly that some Chinese can't connect the water lifelines. Also, developing country don't have enough money to supply the lifelines.

We also think that a lot of country will not able to connect the lifelines because of the global warming. For example, unusual weathers give cities torrential rain, droughts, large typhoons, and etc. We always suffer from these natural disasters. For example, when we have torrential rain, rivers became very polluted due to floods. Large earth quakes cut off water supply. When it happened, we can hardly use tap water.

On the other hand, Japan rarely has water lifelines problem because Japan is an island country and therefore has easy access to water. In addition, Japan has put a lot of effort into waste water treatment technology. For example, water treatment membranes are widely used in Japan so we are always able to drink clean water easily.

Japanese rarely need to worry about drinking water so we should contribute to countries which are in need of it. To that end, we would like to research why Japanese water lifelines are more reliable than other countries and what causes water pollution. Then as a long term goal, we want to find new ways of making clean water. To reach that goal, we will evaluate the quality of various Japanese water sources through biochemical oxygen demand test because this is the most suitable way to evaluate water quality. We also want to compare the BOD values in water in Japan with the BOD values other countries as well. From the result of our experiments, we will find out why the quality of water in Japan is higher than other countries. Then Finally, we want to suggest a new way of making clean water by considering the result of our experiments.

2.4 Method of the research (in comparison with known methods)

What is BOD?

BOD is one of the important method for measuring the water quality.

By using the BOD method, we are able to find how many aerobic microorganisms there are a water sample. To do so, we measure the amount of dissolved oxygen in the water bottle, then compare it with the amount of dissolved oxygen in the water after it was left stand in the bottle for 5 days. If there were many aerobic microorganisms the amount of dissolved oxygen will decrease so that the value of amount of dissolved oxygen in water which was left to stand for 5 days will less than the value of normal water.

Why we chose BOD method?

The reason why we chose those BOD method was because it was the most realistic and suitable method for us. There are 2 reasons why we thought so. First, we started doing this research in the beginning at the December so we didn't really have time to conduct many experiments. Therefore, we needed to choose a method which we can start as soon as possible. Fortunately, a chemistry teacher in our school knows how to conduct the experiment using the BOD method.

Second reason is that, because the equipment and chemicals in our school are limited, BOD was the only method that we could implement with the tools on hand.

For these reasons we decided to use the BOD method for this research.

Equipment

BOD bottle, burette, burette clamp, whole pipet, pipet, Erlenmeyer flask, Big flask, air pump

Chemicals

Sodium thiosulfate (0.02mol/l), Starch solution (dissolve 1g starch in 100ml water), liquid1, liquid2

Liquid1- Dissolve 100g Manganese chloride into 250ml distilled water and add 1ml concentrated hydrochloric acid.

Liquid 2- Dissolve 160 sodium hydroxide into 200ml distilled water. Then dissolve 50g Potassium iodide into it.

About the water that we tested

Tap water in Niigata prefecture- We took this water from the hotel in Yuzawa city in Niigata prefecture.

Melted snow in Niigata prefecture- Niigata prefecture is the place where it snows a lot during winter and also surrounded by forests and mountains. Accumulated snow, pass through nature slowly for 6 years and finally became clean water.

Snow in school- In January, it had snowed a lot in Tokyo, Japan. We took the upper part of the accumulated snow at school.

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Take water more than 450ml into big flask
          ↓
Dissolve air into the water that we took by
using air pump
          ↓
Take water into 2 BOD bottles.
( bottle 1 and bottle 2)
Be careful not to bring air into BOD bottle.
          ↓
Put 1ml liquid1 and 1ml liquid2 into bottle 1
(we do not put anything into bottle 2)
          ↓
Shake bottle 1, 30 times
( make sure to prevent leaking the liquid in
bottle by press the top strongly)
          ↓
Leave stand 2 bottles for 5 days in
classroom with 20℃ air temperature

5 days later
          ↓
Put Sodium thiosulfate( 0.02mol/l) into
burette of 25ml
          ↓
Take 25ml of liquid in bottle 1 into
Erlenmeyer flask by using whole pipet
          ↓
Clamp burette
          ↓
Place Erlenmeyer flask under the burette
and read the scale of burette
          ↓
Turn the cock of burette until the liquid in
Erlenmeyer flask turns light yellow
          ↓
Put the 1ml starch solution into Erlenmeyer
flask
          ↓
Turn the cock of burette until the liquid in
Erlenmeyer flask turns transparent
          ↓
Read the scale of the burette and check
how much the amount of sodium
thiosulfate decreased.
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Repeat this more than 5 times
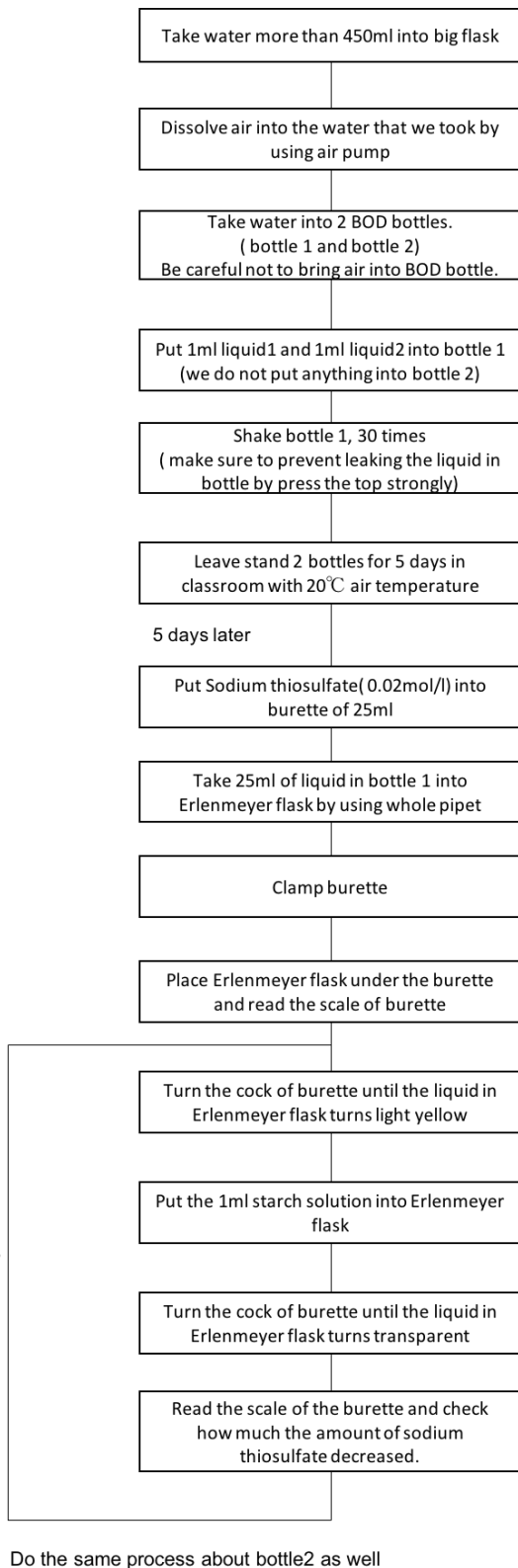
Do the same process about bottle2 as well

Fig.1. Method of Titration

After finding out how much sodium thiosulfate decreased we needed to find out how the amount of oxygen decreased. These are the methods to we used calculate it.

1. Average the value of decreased sodium thiosulfate of bottle 1

2. Average the value of decreased sodium thiosulfate of bottle 2.

3. Subtract the value of average of bottle 2 from the value of the average of bottle 1. - X

4. Substitute the X for Y in the equation below.

$$BOD = \frac{0.02 \times Y \times 8}{4}$$

Eq.(1)

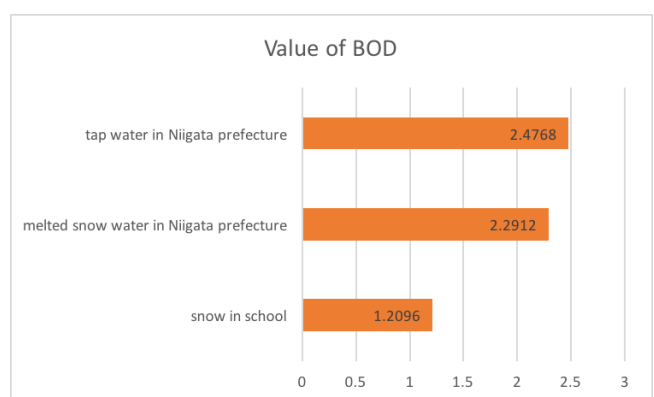## 2.5 Results of the experiment/ research

Fig.2. Value of BOD

The graph above shows the value of BOD for each kinds of water. From this graph we can see that the tap water in Niigata prefecture has the highest value of the three and snow in my school got the lowest value. This means that the quality of tap water in Niigata prefecture is the lowest which means it is dirtiest and the quality of snow in my school is the highest which means it is clean water. According to the official website of Yamanashi prefecture, all these 3 kinds of water will belong to the "A" which means that it's clean enough and we can use these water for our daily lives like for drinking or washing.

2.6 Conclusion

We think the reason why we got values like this is because the tap water and melted snow water had been through many places. For example, tap water had been through pipes for a long time to reach to our houses and also melted

water had been filtered through mountain systems for 6 years. Therefore, some microorganisms should be included in water during that process. However, snow just accumulate on the ground and as I mentioned, we took snow from the top of the accumulated snow, so there are low possibilities that there are many microorganisms in snow because it was on the ground. From this result of experiment, we form the hypothesis that the value of BOD can be influenced by how the water came and where the water came from. So from now on, we're going to test this hypothesis by using the BOD method. There are many things that we need to improve about this research but the biggest problem that we need to solve is the problem of error. We have just started conducting this experiment, so we don't have enough skills and data. Therefore, we want to reduce the errors by conducting more experiment from now on.

2.7 Acknowledgements

2.8 References

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「BOD って？」．山梨県ホームページ．〈http://www.pref.yamanashi.jp/gesuido/116_038.html〉