# Metal resources in sea water

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## 1. Introduction

Nowadays shortage of natural resources is a serious problem in Japan. We focused on sea water that contains various metallic elements and surrounds the Japanese Islands. We expected it to be useful.

Our final goal is to put the operations of separating metal into one process. At this time we set a middle goal of improving the way of separating Na, Mg, and K.

## 2-1 Experiment 1 Collection of Mg

1. Concentrate seawater by using evaporation with gas burner and beaker from 12,000mL to 75mL.
2. Evaporate water gained in step 1 again from 75mL to 10mL Because we couldn't concentrate at once in step 1.
3. Add NaOH aqueous solution (0.10mol/L) to deposit gained in step 1. and step 2. that dissolves 25ml of pure water.
4. Filter white precipitate gained in step 3.

(R table)
Amount of NaOH aq which add
Fig (i) is precipitate gained in step 1.
Fig (ii) and (iii) is precipitate gained in step 2.
Fig (iv) is filtered (iii).

| Precipitate | NaOH aq |
|---|---|
| (i)( 1.00 g) | 2.29 mL |
| (ii)( 1.00 g) | 4.06 mL |
| (iii)( 2.00 g) | 12.92 mL |

## 2-2 Result 1

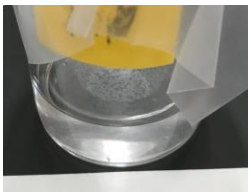


Figure (i)

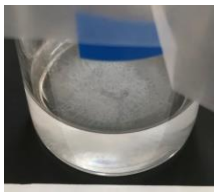


Figure (ii)

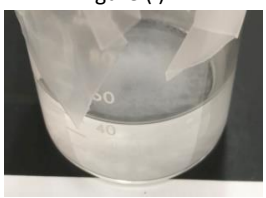


Figure (iii)


Figure (iv)

・White precipitate was found.
・It was a small amount, so we couldn't weigh its mass.

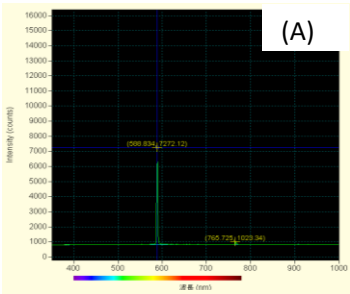
## 3-1 Experiment 2 Separating K and Na

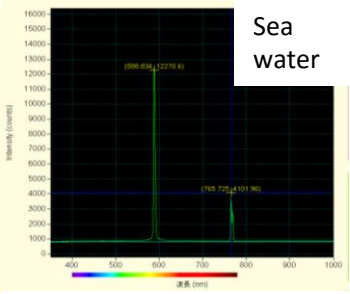
1. Dissolve 1.00g of deposit in experiment 1 to 5.0ml water.
2. Heat up this solution to a temperature of 60 degrees and dissolve 0.10g of deposit.
3. Filter out substances which was not soluble in the solution. ・・・(A)
4. Cool the filtered solution down to a temperature of 10 degrees.
5. Filter out substances which came up in (4). ・・・(B)
   →Repeat from (2 ) to (5) 10 times.
6. Put the substance (A) (B) together with filter paper in a beaker and stir them into water.
7. Analyze flame reaction of this liquid and seawater with Lab.Junior(Spectrometer).
   ⇒We thought we could extract KCl at step 5.

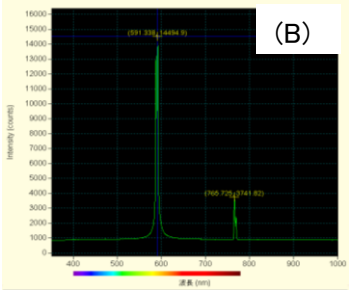
※(The intensity ratio)
=(Max of near 765nm)/(Max of near 590nm) × 100

※The horizontal axis of the graph shows wavelength of light, the vertical axis of the graph shows intensity of wave length.

## 3-2 Result 2




| sample | The intensity ratio |
|---|---|
| seawater | 28.47 |
| (A) | 21.26 |
| (B) | 25.51 |

## 4. Consideration

・Experiment1 : The substances which is considered to be $Mg(OH)_2$ precipitated out. But we couldn't extract enough and analyze what elements is contained in them.
⇒We need to improve these methods; etc. to make the concentration of NaOH aqueous solution higher. We'll entrust a research institution with this analysis.
・Experiment2 : We couldn't extract KCl according to prediction.
⇒We should have taken into consideration the Na content of sea water.

## 5. Perspective

・We will succeed in separating KCl, and search for the effective way.
・We should calculate the difference between the amount of the energy needed for separating one kind of material and that used in industry.
・It took us a lot of time for filtration, so we should consider the other method to shorten the time for it.

## 6. References

「Concentrating Process of Sea Water and Minerals」Shizuo Sugita
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