

the capacity and the toughness of the artificial salmon roe

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<Introduction>

Recently, we heard that portable water called Ooho was used in a marathon in London as a way of rehydration. However, it does not have the toughness to withstand daily life. Therefore, we decided to test how the toughness will vary depending on different conditions. In addition to that we were curious how much water was in the ball, and decided to determine that through experiment.

As enough water is needed to drink, we investigated the relation between the quantity of liquid and the reaction time. To make a membrane that doesn't tear during transportation, we researched the change in the toughness of the membrane, depending on the reaction time and the concentration of the sodium alginate aqueous solution.

<Methods>

Sodium alginate aqueous solution was frozen in an ice tray, and was reacted with calcium lactate. This experiment is performed under the conditions shown in Figure1. The volume of the artificial salmon roe and the gel inside was measured. As well, we measured the toughness of each artificial salmon roe using a handmade pressure indicator. (Figure2)

Figure1: the condition of the experiment

Figure2: pressure indicator

calcium lactate	sodium alginate	reaction time					
		10min	20min	25min	40min	50min	70min
10g/L	10g/L						
	20g/L						
	30g/L						
	40g/L						
	50g/L						



Cut the artificial salmon roe which has been taken out. Place the capacity of the artificial salmon roe as the volume of liquid poured out from the roe. The mass volume is equal to the capacity and the membrane's volume.

<Measuring method>

It is a capsule made by the gelation of sodium alginate aqueous. An alginate is a slimy substance found in brown algae. It has the property of reacting with divalent metal salt and gelling.

In these experiments, we create it by mixing sodium alginate aqueous and calcium lactate aqueous.

<Result>

Figure3: Relationship between capacity and reaction time

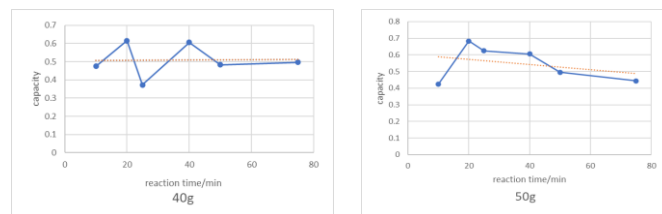
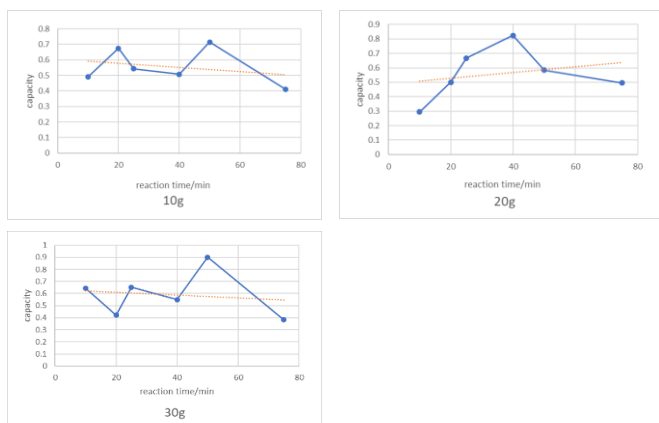
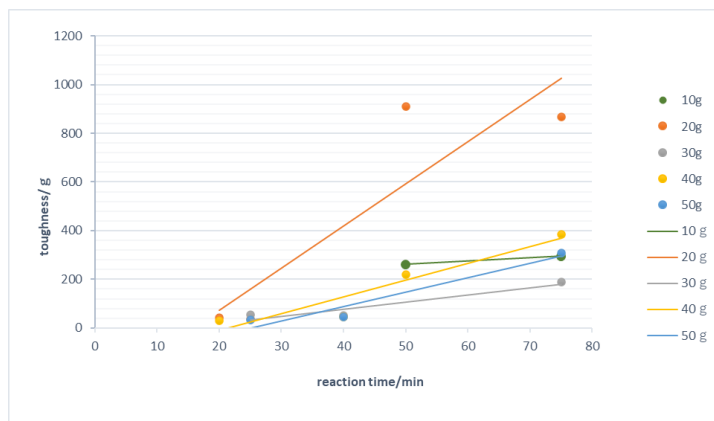


Figure4: Relationship between toughness and reaction time



<Consideration>

We did an experiment in 75 minutes, but we couldn't find a correlation between the reaction time and the capacity very much. But it seems that the capacity is decreasing because it dwindled to zero 24 hours later.

From Figure3, we found that the membrane becomes stronger as the reaction goes on. Besides, on the whole, the toughness increased suddenly in 50 minutes. Regarding from the concentration, the toughness of membrane in 20g/L became the highest. This is thought that the membrane is the most dense because sodium alginate and calcium lactate react exactly in this situation.

<Outlook>

In this experiment, we couldn't take detailed data of 90 minutes or more because we didn't have enough time. Therefore we want to experiment for a longer time. Also, it seems that changing the concentration of calcium lactate aqueous solution is suitable for confirming the consideration. Plus, we will be able to examine the detailed data of sharp changes of toughness by increasing the number of experiments between 40 minutes and 50 minutes.

<References>

1) 海藻からつくる人エイクラ

https://www.jstage.jst.go.jp/article/kobunshi1952/47/1/47_1_33/article/-char/ja/

2) 人工いくらを作ってみよう!

<https://school.gifu-net.ed.jp/enahs/ssh/H22ssh/sc2/21050.pdf>

