

# More about Storm Glass

Tatsuno High School



**Purpose** Finding out why storm glasses change depending on the weather and what the crystals are.

## Motive

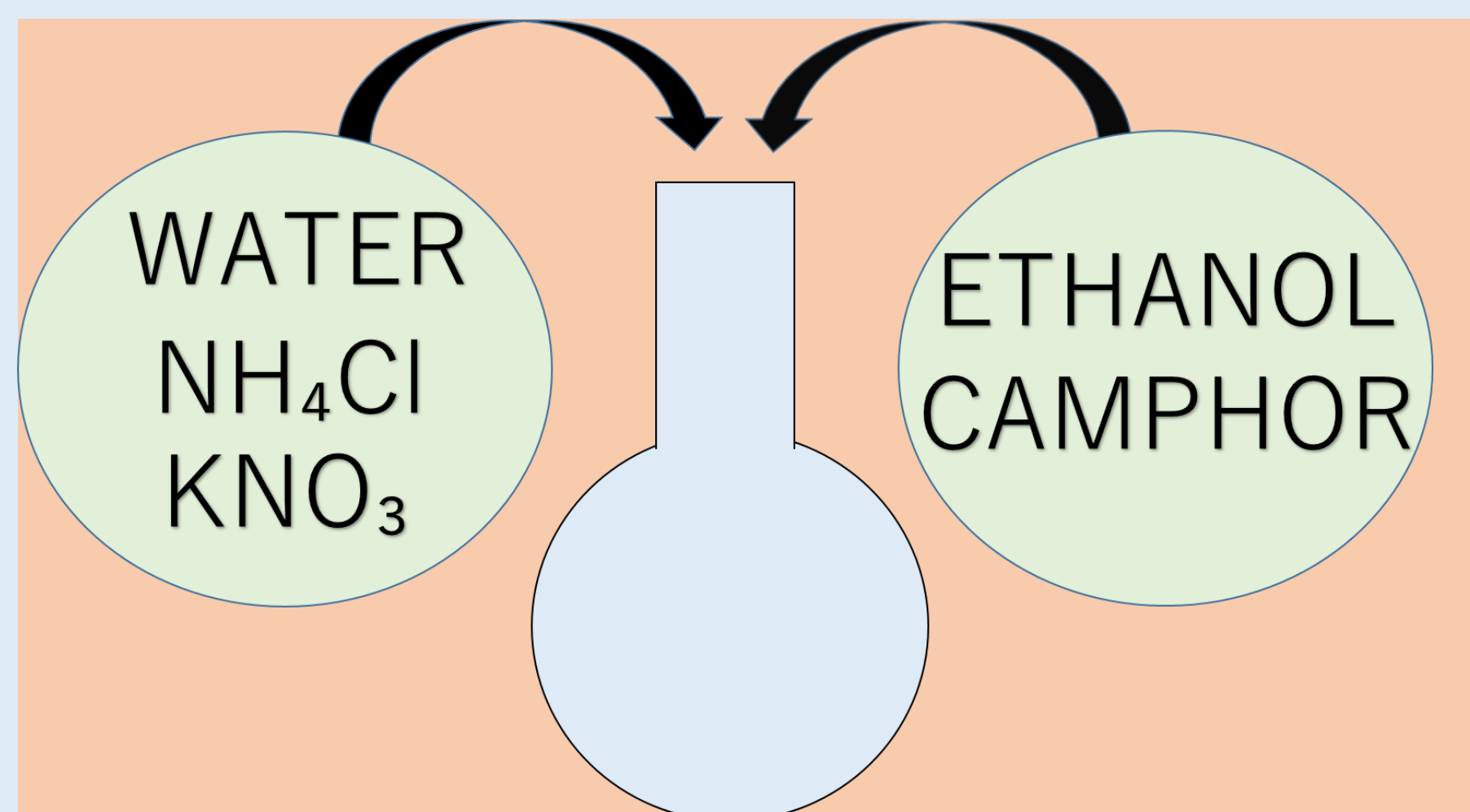
- We wanted to do experiments using camphorwood, a symbolic tree of Tatsuno High School.
- We were interested in storm glasses made from a substance called camphor.



## What is Storm Glass?

[Materials] Distilled water(60ml), Ethanol(70ml), Camphor ( $C_{10}H_{16}O$ )(15g),  $KNO_3$ (5g),  $NH_4Cl$ (5g)

[Recipe] [Changes depending on the weather]

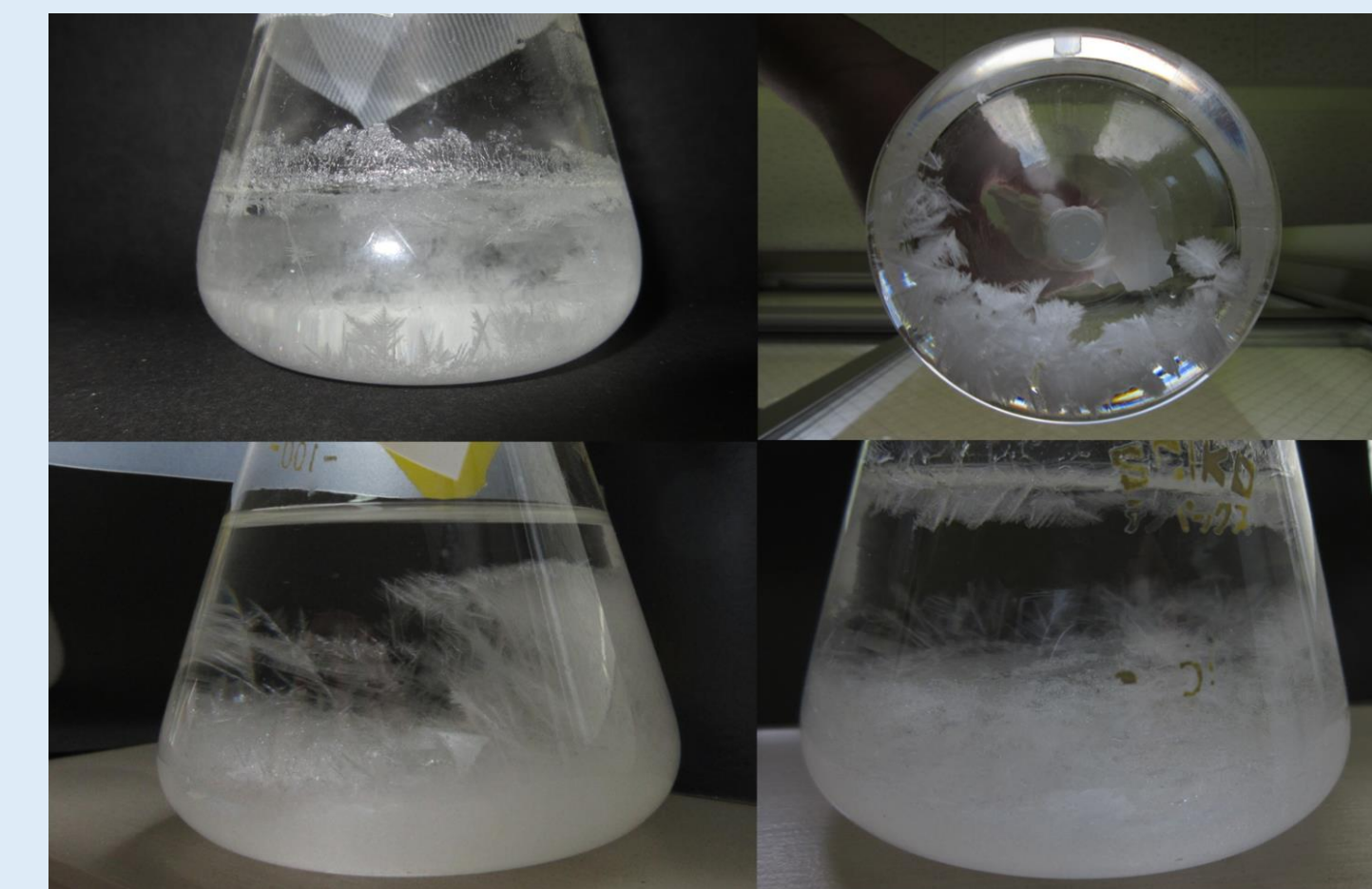


Weather						
Crystal	Little	Star	Little	Star	Muddy	Fern
Position	Bottom	All	Bottom	All	All	Opposite of storm

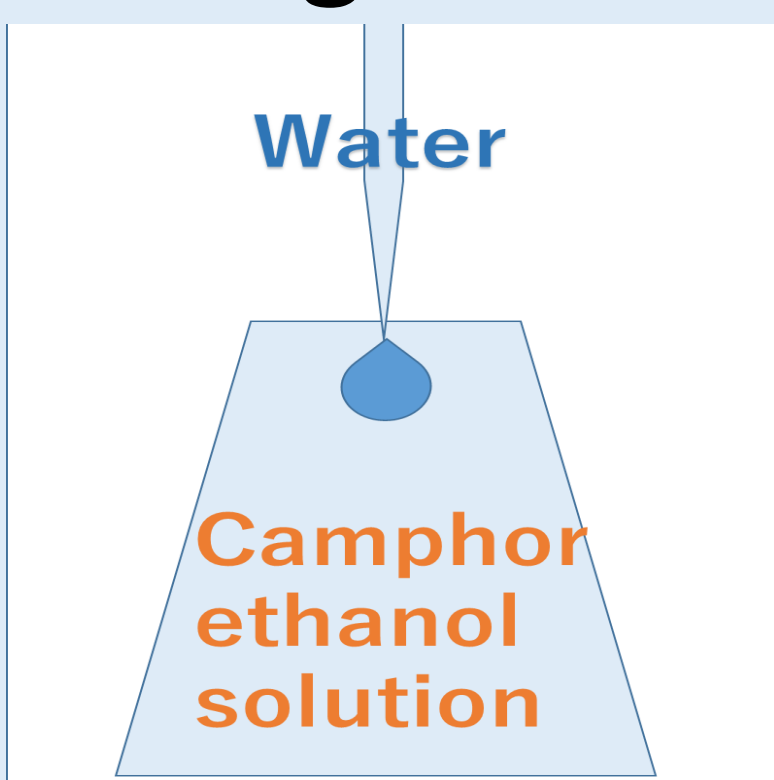
[Use] Storm Glass was used in Europe in the 19<sup>th</sup> century as a tool to examine the weather during voyages. Now it is used for necklaces and ornamental miscellaneous goods.

## 1. The Observation of Storm Glass

- < Hypothesis > The largest factor is temperature change.  
 < Experiment > Weather, temperature, humidity, atmospheric pressure (morning, noon, afternoon).  
 < Result > • Different crystal shapes and volumes were observed.  
 • Hot days: Few crystals were seen.  
 • Cold days: A lot of crystals were seen.  
 < Consideration > There is a factor except for temperature.

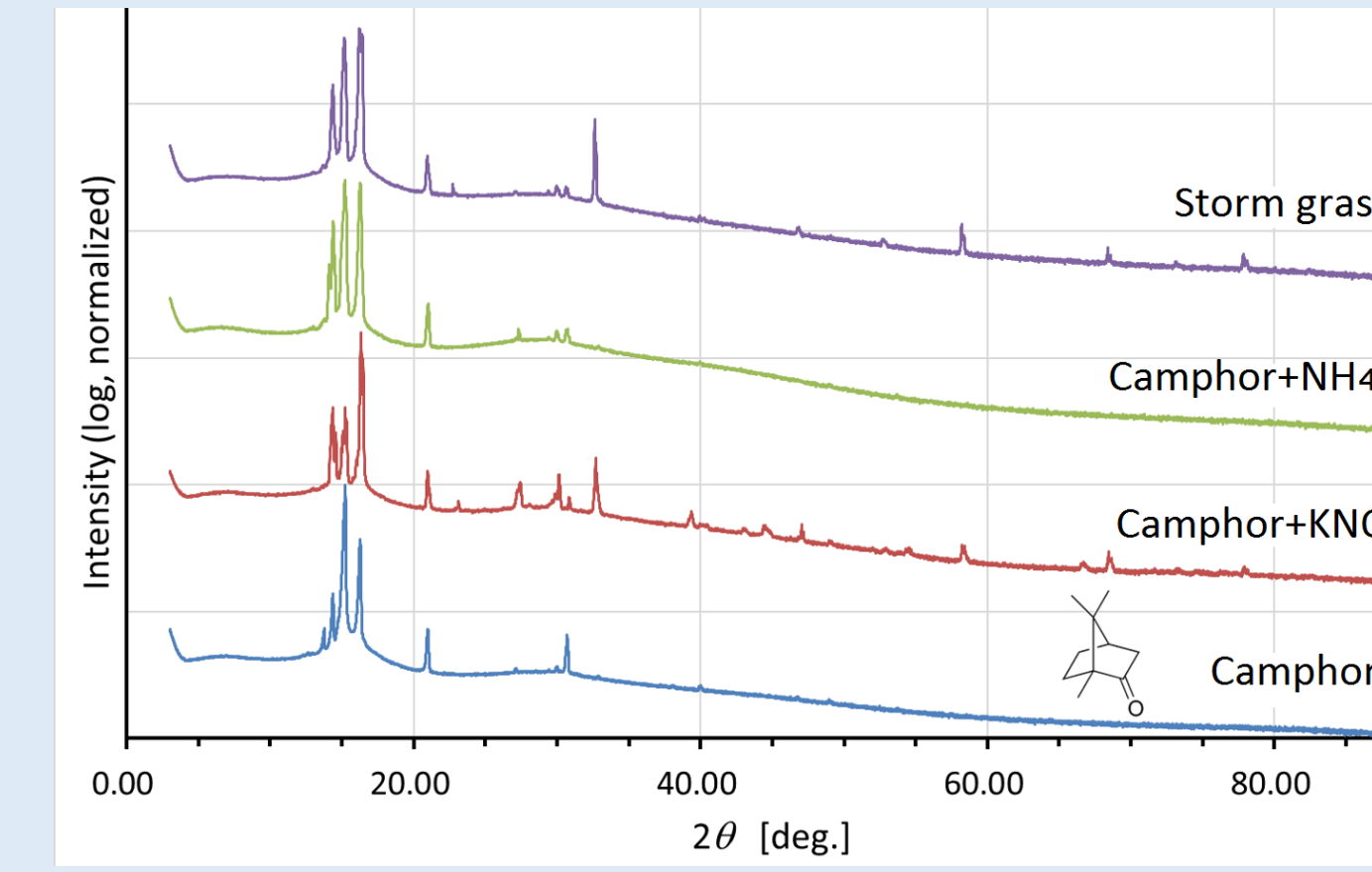


## 2. The Relationship between Camphor and Water Component Ratio

- < Hypothesis > Storm glass consists of saturated solution of camphor.  
 < Experiment >  < Result > The materials couldn't dissolve any more when we added 29.5ml of water to the solution.  
 < Consideration > we found Storm glass consists of saturated solution of camphor.




## 3. Component of Crystal

- < Hypothesis > The main component of the crystals might be camphor.  
 < Experiment >  < Result > Crystals appeared in the three types of solution, which contained camphor.  
 < Consideration > The main component is camphor.  
 ✕ X-ray diffraction confirmed the main component to be camphor.

Camphor	$KNO_3$	$NH_4Cl$
Camphor + $KNO_3$	Camphor + $NH_4Cl$	$KNO_3$ + $NH_4Cl$

## 4. Verification of the Atmospheric Electricity Theory

- (1) < Hypothesis > Camphor has some charge.  
 < Experiment > Add 0.01mol of the following substances to the solution (water, ethanol, camphor).  
 + :  $NaCl$ ,  $CaCl_2$ ,  $Al_2(SO_4)_3$   
 - :  $NaCl$ ,  $Al_2(SO_4)_3$ ,  $Na_3PO_4 \cdot 12H_2O$   
 < Result >  < Consideration > Camphor is positively charged.
- (2) < Hypothesis > Apply positive electricity to one side, crystals appear on the opposite side.  
 < Experiment > Apply positive electricity for 4 hours. ( $1.0 \times 10^6 kV$ )  
 < Result > No change.  
 < Consideration > Our experiment doesn't support the verification.



## Summary

- We didn't check any influence by the weather.
- The main component of Storm Glass crystals is camphor.
- The amount of Storm Glass's material is fixed to a saturated mixed solvent, composed of pure water and camphor.
- We can deny the theory of atmospheric electricity.

## Future Prospect

- We are going to find out how  $KNO_3$  and  $NH_4Cl$  work.

## References

- Sei Fukushima & Toshinobu Hongou

• *Kessyo Henka de Tenki wo Yosoku!? Storm Glass ga Utsukushiku Gensouteki!*  
<https://matome.naver.jp/odai/2142043430289007501/2142050793055541403>