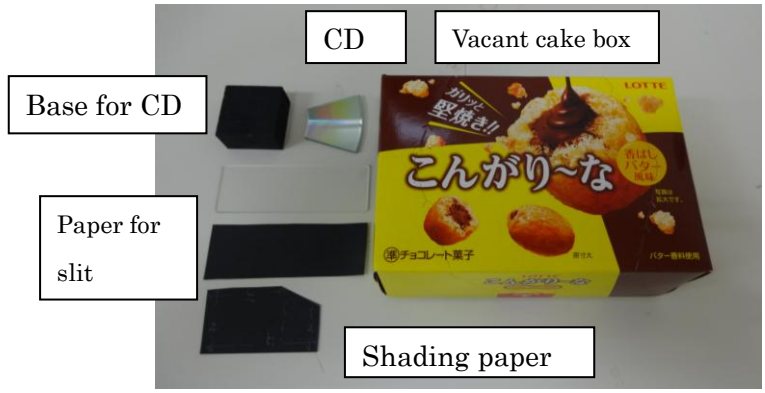
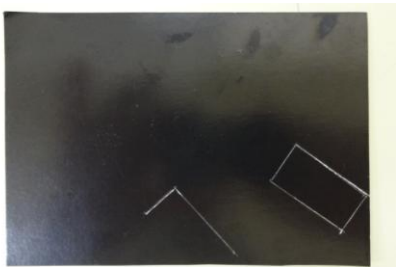
<Chap. 3 Group Experiment>

1.Construction of CD spectroscope

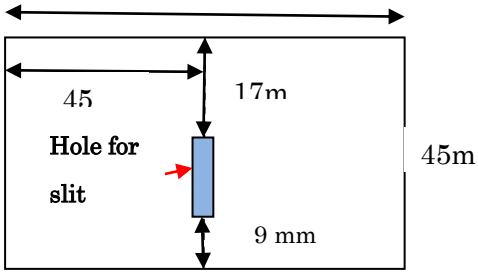
・components for construction

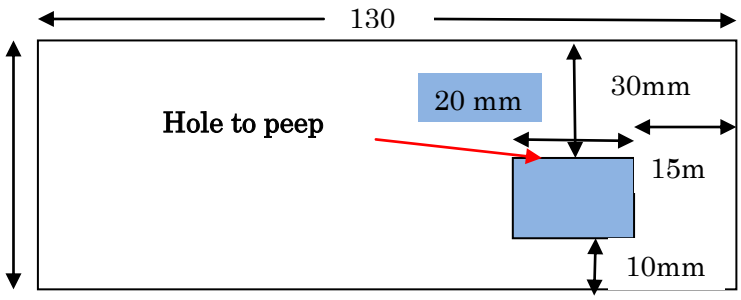


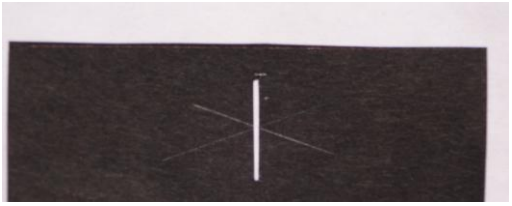


Hard paper as the base of spectroscope

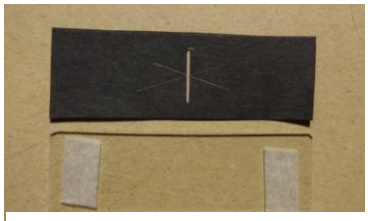
・Cut the box to make holes







Slit is made by cutting the black paper with a dimension of 18mm length and 1mm width



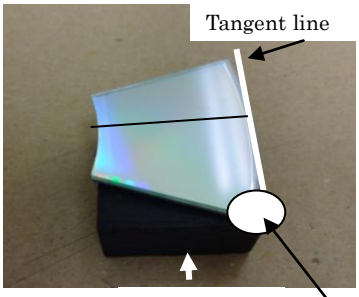
Attach the slit on a slide glass

Attach the slide glass at the front of the box

Attention: spectrum consists of the image of the slit, thus slit shape should be fine

Don't touch on the surface of CD by your fingers!

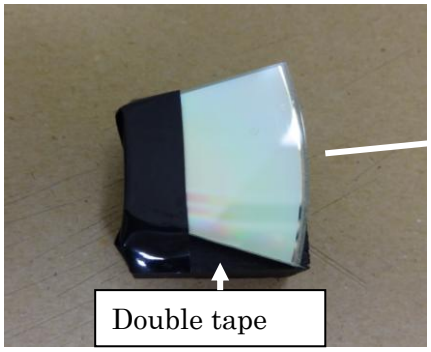
CD is attached on the wooden base by double tape

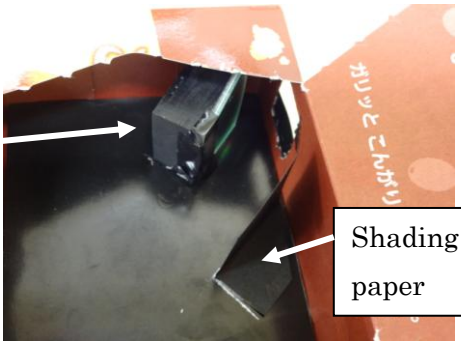


Down side

The ditches of CD are used as grating, thus the ditches should line vertically against the bottom plane.

This edge should not come out over the wooden base



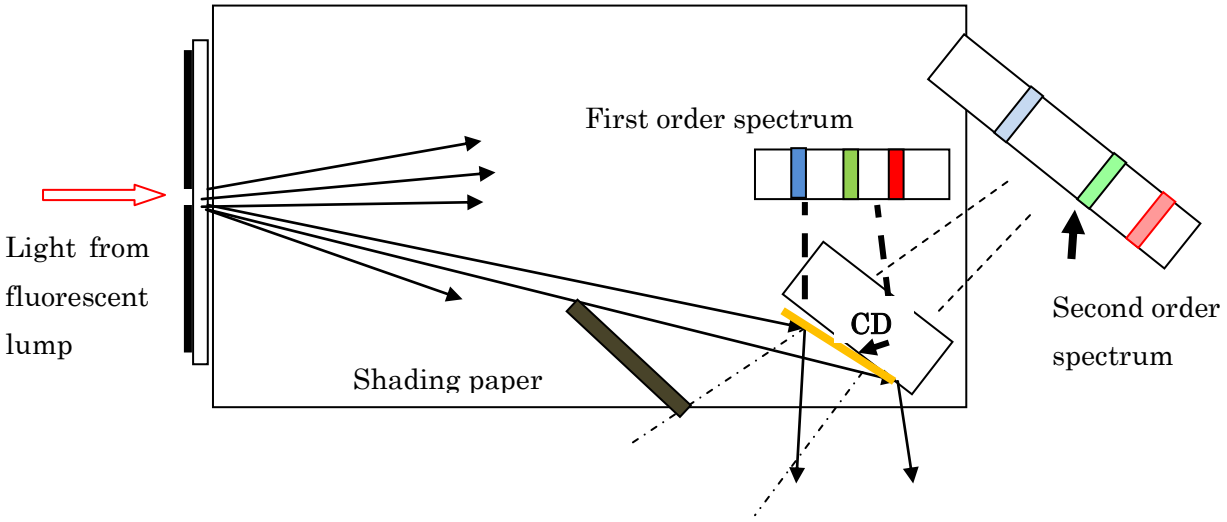


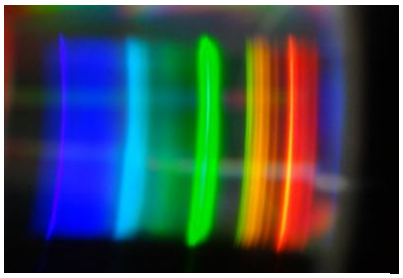
Inside part of CD should be blocked by black tape. The black wood with CD is fixed on the hard paper put as the base in the cake box following the mark on the paper..

Completed CD spectroscope

Fix a wooden chopstick at the top of the box so that the direction of light ray coming to the spectroscope can easily be known.

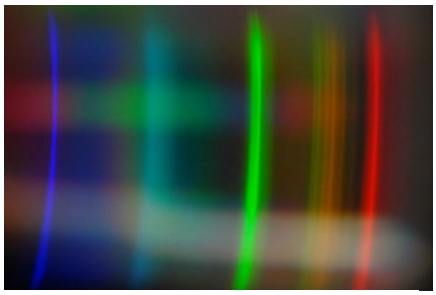
・Top view of the spectroscope



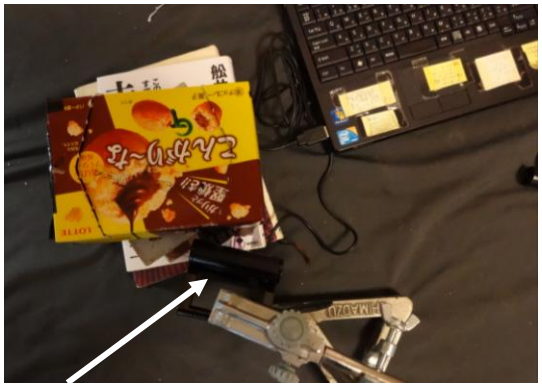


The First order spectrum

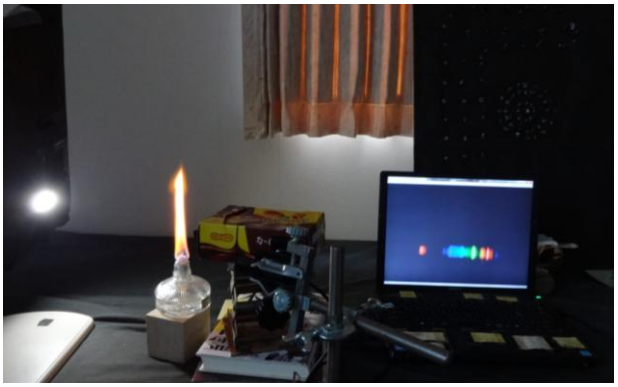
When you want to see the second order spectrum,, turn a little your eye to the right direction



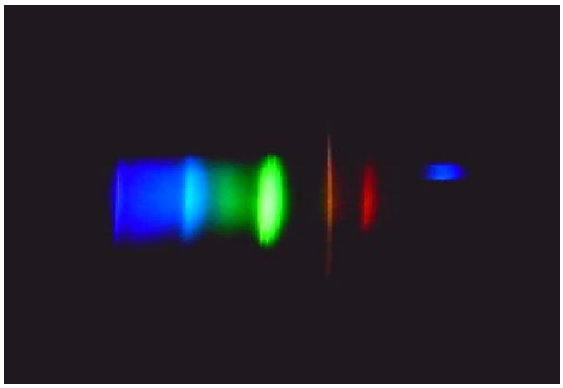
The Second order spectrum



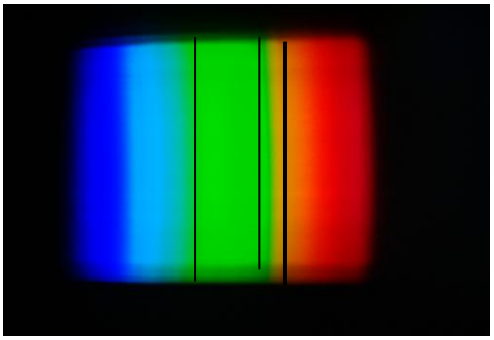
Web camera is set at the exit of the spectroscope to get the second order spectrum.



Spectrum is displayed on PC display, then can keep in it by pushing Key of " Part Sc Sys Rq".

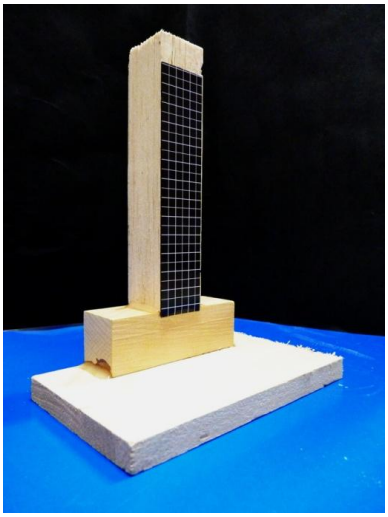


Na atomic line (from flame) together with spectrum of fluorescent lamp.



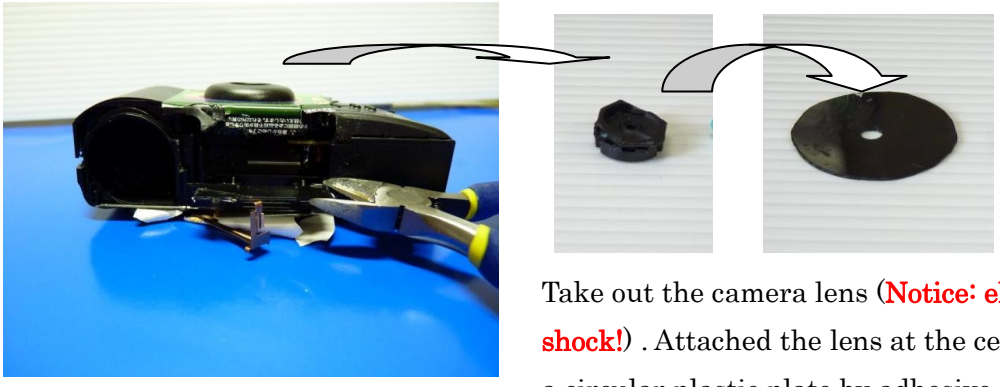
Sun light has a continuous spectrum with some dark lines(due to absorption).
To see the spectrum of sun light, just direct the slit of the spectroscope to the sky.

2.Construction of microscope using a disposal camera lens

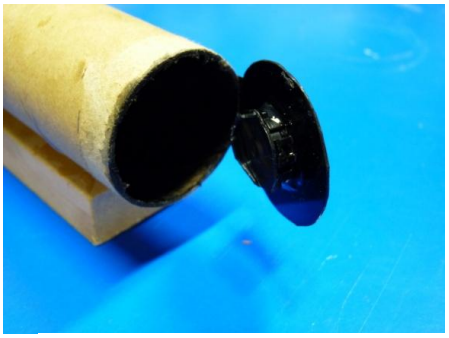


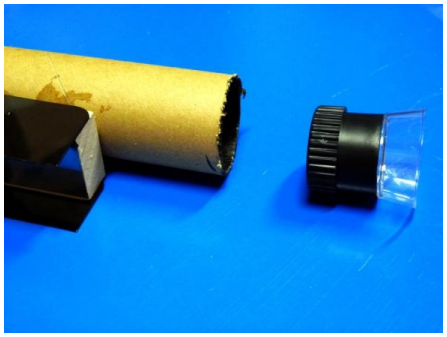
Body is made of wood

Inside of paper pipe should be painted to be dark.

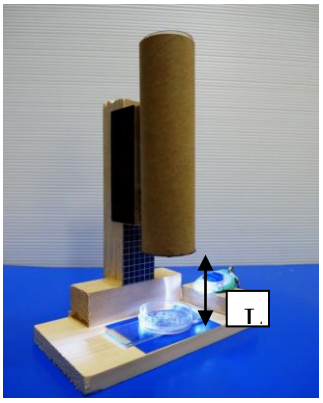


Take out the camera lens (Notice: electric shock!) . Attached the lens at the center of a circular plastic plate by adhesive..

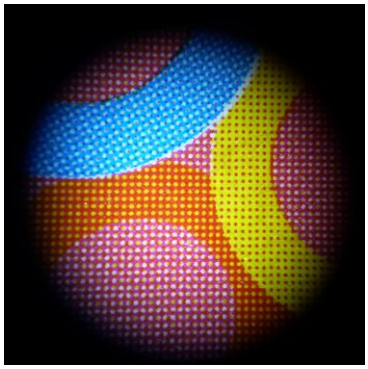




The camera lens is attached at the end of pipe, which becomes an objective lens, while a loupe lens is used for eyepiece.



Please notice the working distance (about 55mm) is larger than ordinary microscope.



A completed microscope(left) and the image of color print dots, which shows the ability of this microscope; about 30 of magnification.

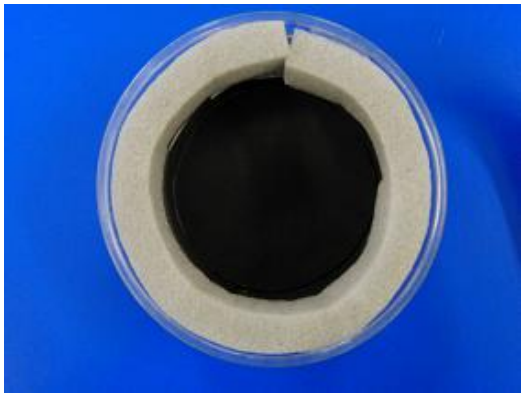
3.Construction of cloud chamber to observe α particles

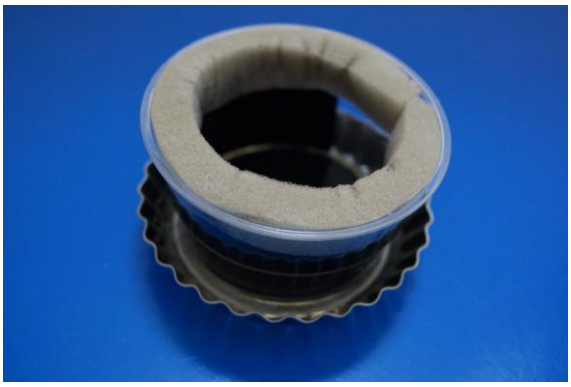
Components to construct a cloud chamber.

Cut a plastic cup.

Combine the cup with a metal plate by adhesive..

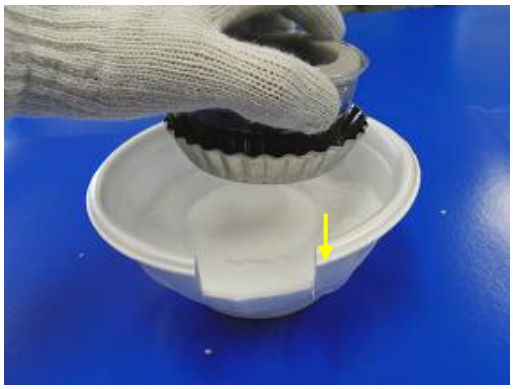
Attach a cushion tape at the top of the plastic cup.





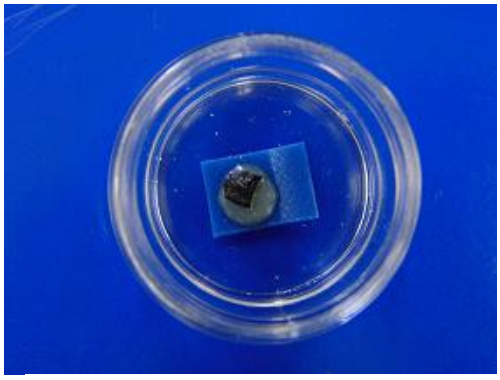
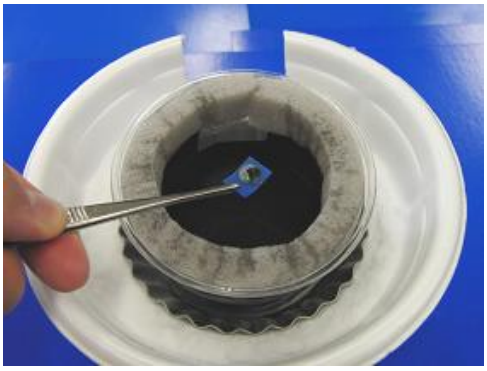
Put a black paper down, also inside side of the chamber except for the place of the window used for illumination.

Lumps of dry ice are stroke to make powder.

The prepared chamber is put with tight contact on the dry. ice.


Alcohol is sunk enough into the bottom black paper and the cushion tape.

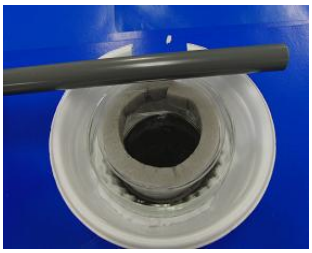



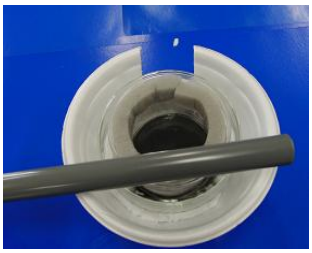
Weak radioactive source should be picked up using pincet (don't touch with finger) , and put on the bottom of the chamber.

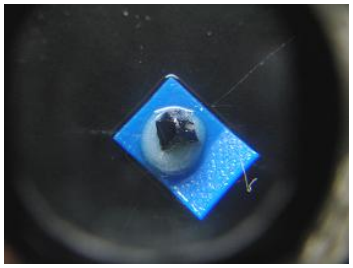
Cover the top of the chamber with plastic Petri dish or cooking rap.

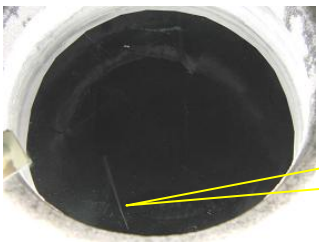
Illuminate the inside of the chamber so that the trace of cloud can be seen clearly.

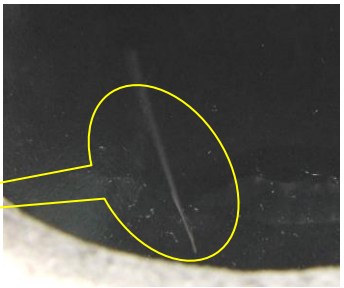
Attention: Residual ions disturb the production of cloud in the chamber, thus often charge must be removed by using static electricity.









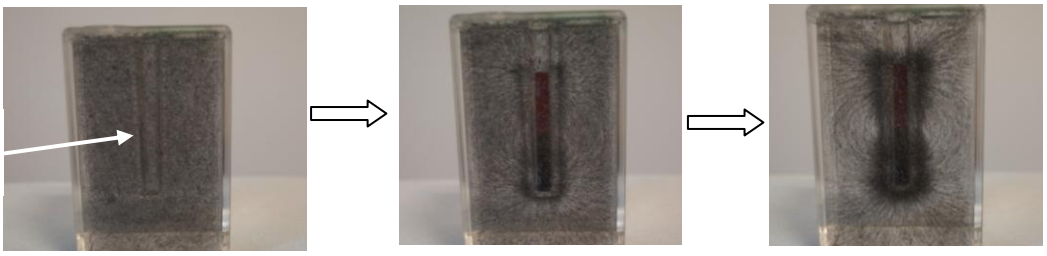


This chamber is generally called as cloud chamber; The bottom region of the chamber is extremely cooled down by dry ice, and the alcohol vapor become supersaturated condition. When α particle come into the region, gas is ionized to make many ions and electrons. Then the alcohol vapor become instantly to small droplet following the trace of the α particle. By this method, sometimes we can see the cosmic ray coming from the universe!

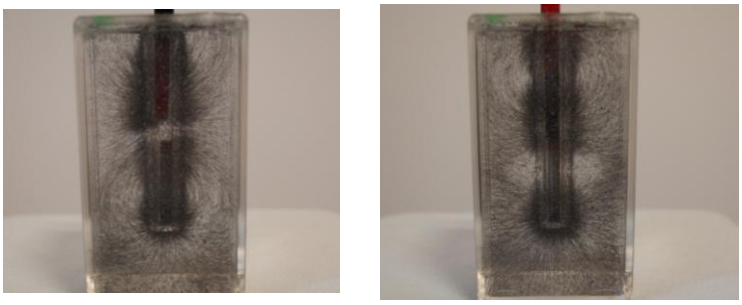
4 .Some experiments of magnet field

・ Observation of magnetic field using metal particles scattered in oil liquid

rod magnet



Just after shaking　　After several seconds　　After 30 seconds



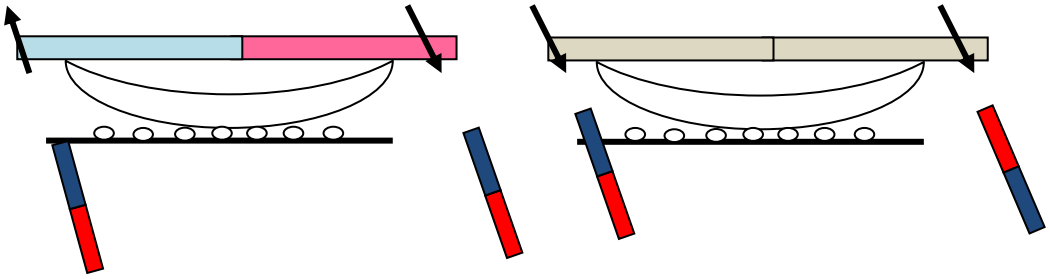
For the case when two magnets are inserted in a hole.

・A magnet works as a compass

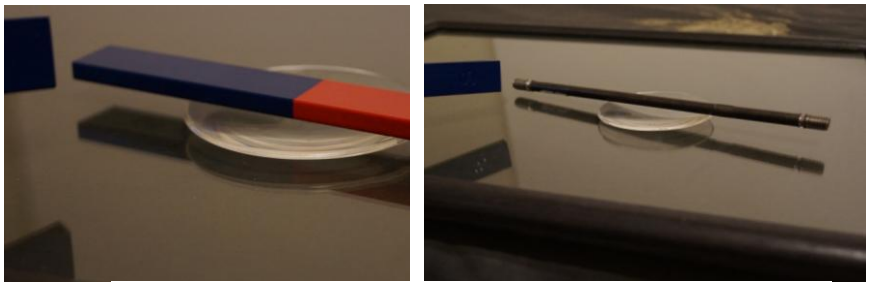
Floated in water　　Put on frictionless plate　　Hung with a string

(Magnet is in a plastic bag)

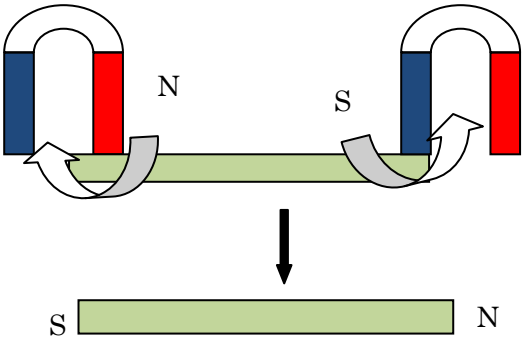
<High sensitive detection of magnetic field using frictionless method>



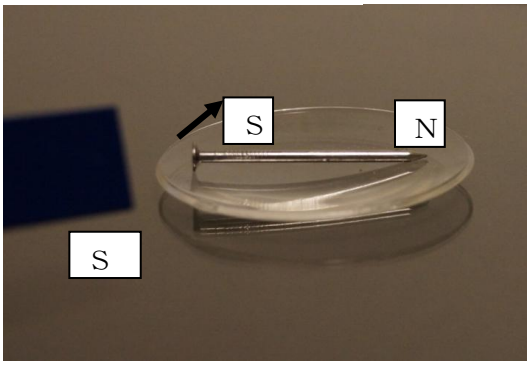
If a iron rod has magnetization, both of attraction and repulsion takes place when we close magnet, while for no magnetization only attraction takes place..



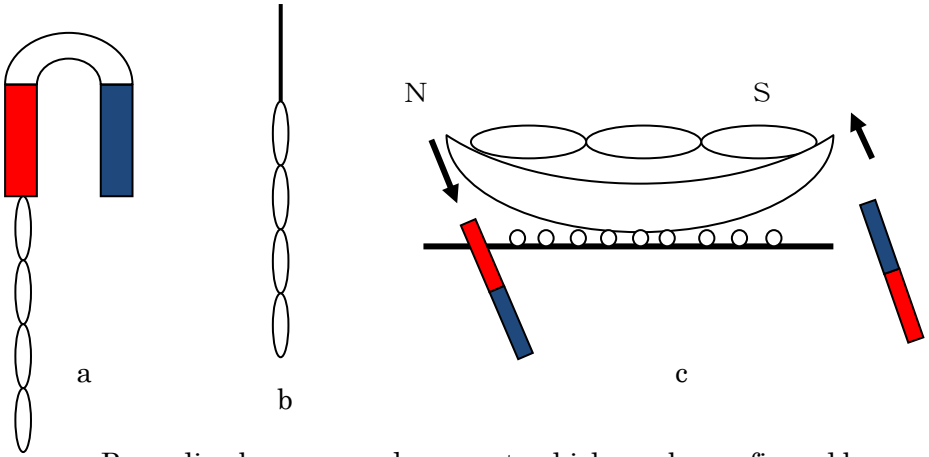
High sensitive detection method of magnetization



By rubbing iron rod it becomes magnet.



Please confirm nail becomes magnet after



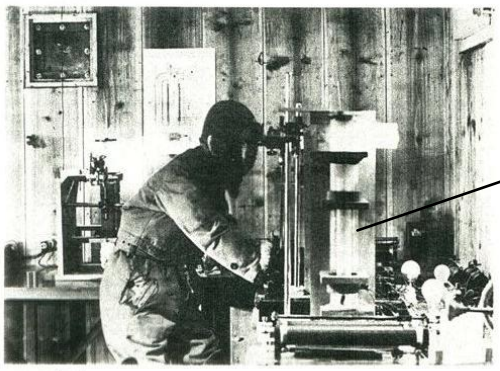
Page clips become weak magnet, which can be confirmed by using the high sensitive detector of magnetization.

Please examine wooden rod (chopstick) has magnetization or not!

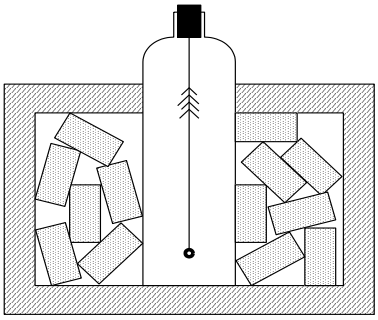
5. Artificial snow crystal

・In 1936, Prof. Nakaya (Hokaido University, Japan.) succeeded in producing artificial snow crystal for the first time using low temperature laboratory. The snow crystals were made on a fine rabbit hair. From this research, it was proved that the shape of snow crystals is determined by the humidity and temperature during the crystal growth.

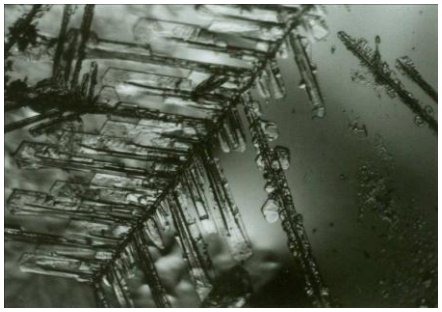
Microscopic view of a natural snow crystal.



1936, artificial snow crystals were produced in the laboratory.

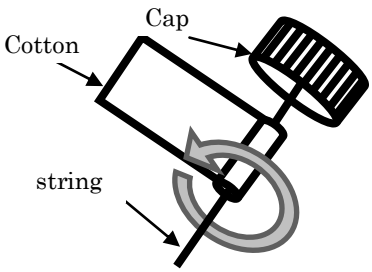


Artificial frost is produced using dry ice.



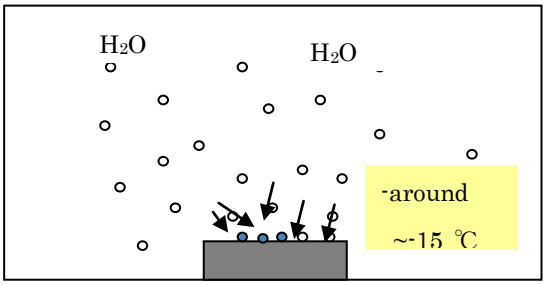
Microscopic view of frost.

Compact equipment to make frost.



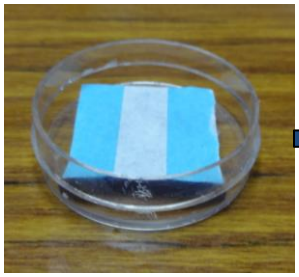
Close-up photo of frost

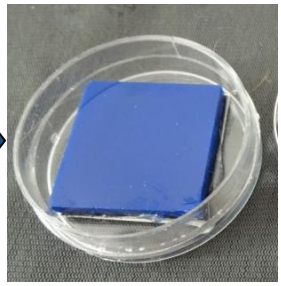
Necessary condition to make snow crystal ----→ Temperature, Humidity, Seed (nucleus)



Water vapor consists of H_2O.

H_2O molecules condense to make crystal at around -15 ℃. In the atmosphere, dusts in air become the nucleus of the snow crystal growth.

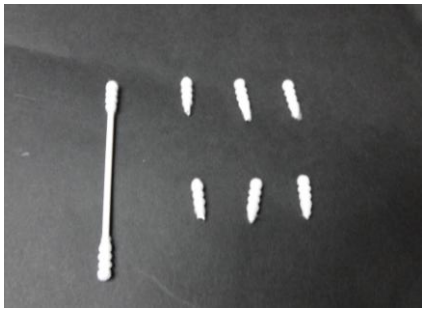




Black tape is also used as the substrate.

When the paper cover is taken out, the surface of the plastic is charged up , and it enhances the generation of the nucleus of snow crystal.

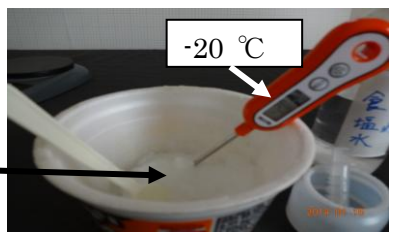
Container to make snow crystal.



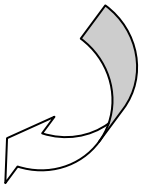
Chips of cotton are used to supply water vapor.

Ice crusher to make fine ice

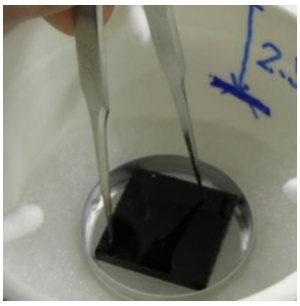
Crushed ice=100 g, salt=45g, water=20 cc



Cooled ice



Mixed well



The cap which attaches the substrate is placed on the cooled ice, and pushed by pincet to make tight contact with cooled ice.

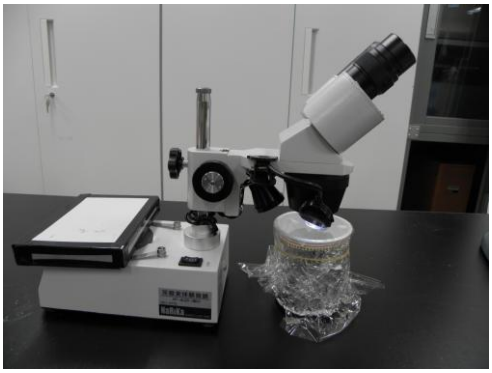
Insert the plastic ring in the container.

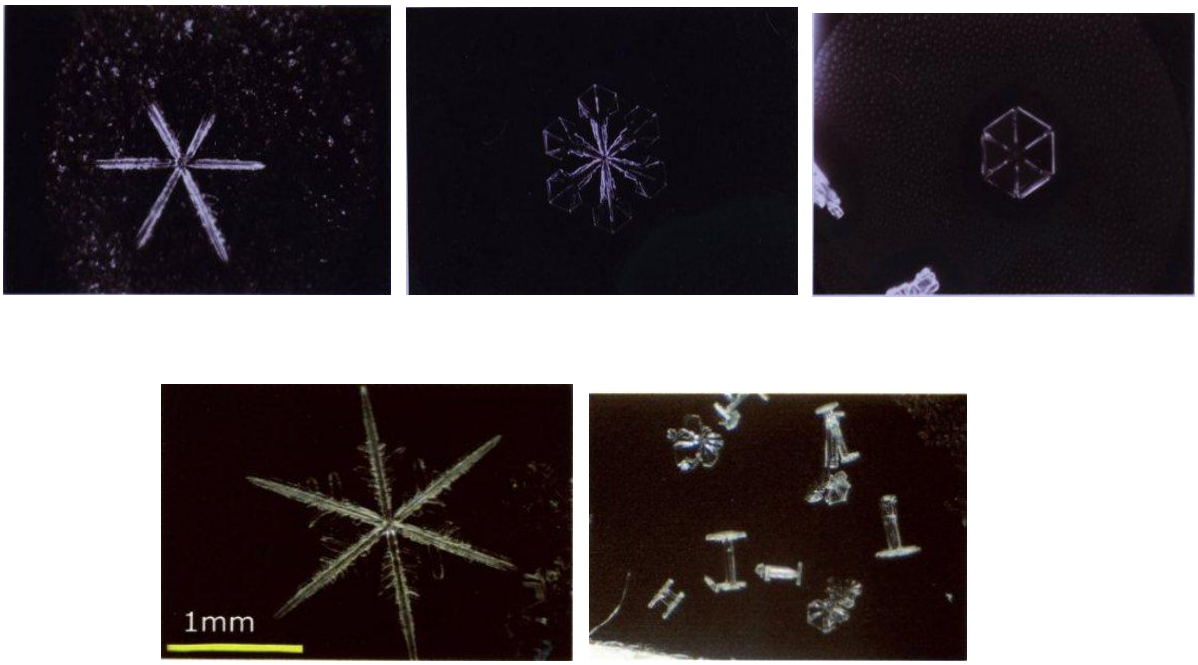
Insert several chips of cottons into the hole.

After rapped by cooking film, dry gas is sent to exchange with humid air, then close using a rubber band.

Few droplets of water are sent to the chips of cotton.

Keep for 15 ~ 20 minutes.





Microphotograph of several types of artificial snow crystals.

<Sketch the snow crystal you made by yourself>

Please see science movie (free) of “Kagakueizoukan” (Japan)
http://www.kagakueizo.org/