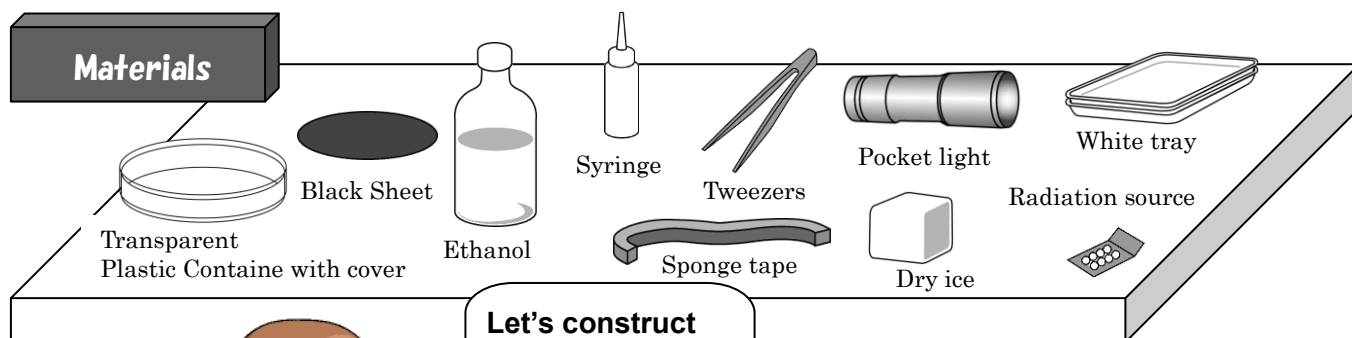


How to

Construct Cloud Chamber



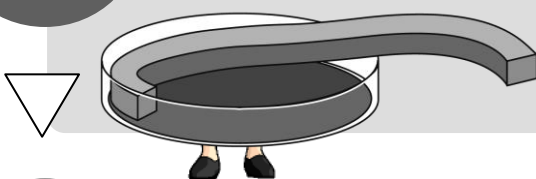
Let's construct a cloud chamber following this instruction !

Before your experiments,

- (1) Let's enjoy experiment with adults.
- (2) Do not drop a plastic container. It is fragile.
- (3) Do not touch dry ice directly by your hand.
- (4) Do not use ethanol near fire.

1

Put sponge tape inside of plastic container



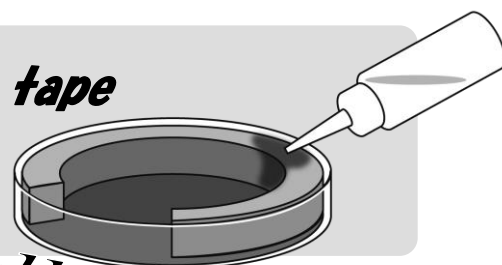
- Spread black sheet in the container.
- Put and paste sponge tape on the top of the inside of the container.

Cover of the container must fit tightly.

2

Infiltrate ethanol into sponge tape

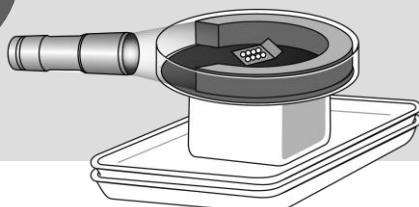
- Infiltrate ethanol using a syringe into the sponge tape fully.



Fully...

3

Cover the container and illuminate inside



- Put radiation source on the black sheet and cover the container.
- Put the container on dry ice.
- Illuminate inside of the container from a side.

Do not touch dry ice directly by hand!

4

Observation of track of radiation

- After around three minutes, you can see some white tracks like vapor trails of airplane.



Let's Observe Tracks of Radiation using Cloud Chamber

Unfortunately, we cannot see radiation itself.

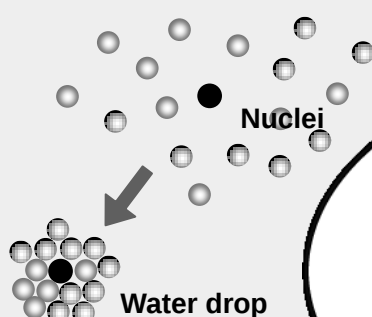
We can observe "tracks" of radiation when we use a tool called "Cloud chamber".

The radiation tracks are like vapor trails of airplane in the sky.

Cause of the track clouds

Cloud is a small drop of water, as a result of gathering of vapor in air. Dust in the sky would be nuclei of the cloud.

When vapor in the sky is cooled down immediately and the air is over-saturated by vapor, the radiation track clouds could be easily generated.

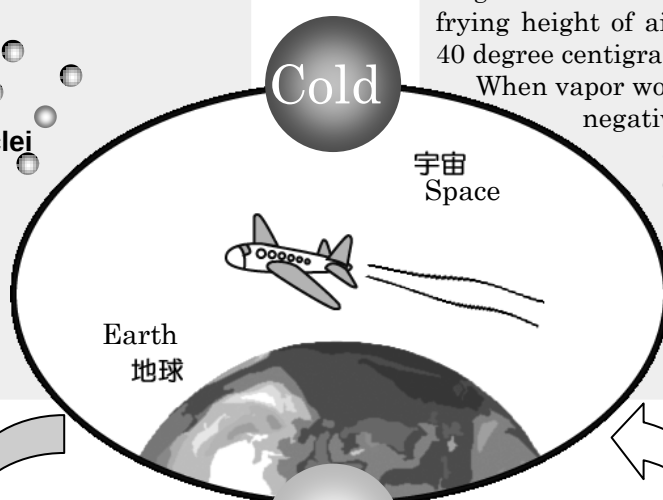


Cause of vapor trails of airplane

Vapor trails are not exhaust gas from airplane. The trails are tracks of water vapor. These are clouds of water.

Temperature would decrease 0.6 degree centigrade at the height interval of the 100 meters. Therefore, temperature at the height of around 10,000 meters, which is the flying height of airplane, is about negative 40 degree centigrade.

When vapor would be cooled down in the negative 40 C environment, airplane flies in this, exhaust gas becomes nuclei, then vapor trail cloud is generated. Sky air needs to be filled with water vapor to generate vapor trail.



Temperature of dry ice is negative 79 degree centigrade!! Too cold!



Amazing! Tracks of cloud chamber is like vapor trails!!

In cloud chamber

In place of water vapor, ethanol gas is used in cloud chamber.

Extreme temperature difference between air and dry ice is also important.

Radiation (alpha particles) from small monazite rock as a radiation source hits molecular in the container and generates ions. These ions would become nuclei of cloud. Then we can see radiation tracks as this cloud.

*Monazite rock

Monazite is one of natural rocks. The rock exists naturally in Japan as well as in other countries. Thorium and Uranium existing naturally in monazite rock emit radiation.



Cold

Novel Prize

Charles Thomson
Rees Wilson,

British Physicist (1869-1959) was deeply moved by beautiful cloud and fog at Mt. BenNevis (1,344m). He started new experiments on cloud and fog generation, and succeeded in developing a cloud chamber.

Radiation is invisible. However, we can see tracks of radiation by using cloud chambers. His cloud chamber became extremely important tool for researchers on radiation and nuclear physicists. Dr Wilson received Novel physics prize in 1927 by his achievement relating cloud chamber.