



Development and Educational Application of Cloud Chambers

Targeting Each Generation Level



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What is RADO?

RADO corporation, founded in 2001, is a only Japan's manufacturer specializing in cloud chambers. RADO manufactures a variety of cloud chambers, including small cloud chambers for student experiments at elementary schools, desktop cloud chambers for use in universities, and permanent cloud chambers for display at science museums. RADO has outstanding technology for cloud chambers, and that technology continues to advance.

RADO has cooperated with various IAEA-TCPs such as RAS0065 and 0079.



RADO

Cloud chamber movie

What is Cloud Chamber?

Cloud chamber is a revolutionary device that allows us to see tracks of radiation. When radiation passes through supersaturated alcohol vapor, a contrail-like cloud of alcohol forms along its path. By shining light on this cloud, we can observe the tracks of radiation. Cloud chambers are very important devices for understanding radiation and learning about atoms and nuclei. A cloud chamber was invented about 100 years ago (1911) by British scientist Wilson (1869-1959). In 1927, he was awarded the Nobel Prize in Physics for his "research into the method of observing the tracks of charged particles using a cloud chamber."

Types and characteristics of cloud chambers and their current main educational purposes

Types of cloud chambers	Pictures	Features and educational purposes
Dry Ice cooling (small & middle)		<ul style="list-style-type: none"> Assembling cloud chamber by hands in schools Understanding the principle of the cloud chamber Radiation sources; monazite and radon gas
Dry Ice cooling (large)		<ul style="list-style-type: none"> Mainly for high school and university students Experiment of the permeability of radiation Experiments on the Compton scattering and half life Using liquid nitrogen, easy to got at schools. Mainly for observation of the tracks of natural radiations
Liquid nitrogen cooling		<ul style="list-style-type: none"> Displayed in science museums Observing many tracks through a large observation window Easy to understand the existence of the natural radiation Coolant such as dry ice, unnecessary Easy to observe long tracks of cosmic rays
Compressor cooling		<ul style="list-style-type: none"> Coolant such as dry ice, unnecessary. Short preparation time to see tracks of radiation Radiation sources; monazite and radon gas Mainly for observation of the tracks of natural radiations
Peltier element cooling		<ul style="list-style-type: none"> Coolant such as dry ice, unnecessary. Short preparation time to see tracks of radiation Radiation sources; monazite and radon gas Mainly for observation of the tracks of natural radiations

Educational Application of Cloud Chambers Targeting Each Generation Level

Cloud chambers have been mainly applied in the fields of education on radiation and nuclear science. However, we believe this device has a big potential to be used for various education theme. The table below shows some examples of its possibility following the Japanese official syllabus.

Generation Level	Subject	Explanation in Syllabus	Education Contents using Cloud Chamber
Grade 4 (9 years old)	Society	Teach students to acquire the following skills through activities to pursue and solve learning problems related to businesses that support people's health and the living environment. <ul style="list-style-type: none"> Businesses that supply drinking water, electricity, and gas must be proceeding to ensure safe and stable supplies. Being useful in maintaining and improving the healthy lives of local people. 	<ul style="list-style-type: none"> Types and characteristics of various power generation methods (10min) Nuclear power generation as one of the power generation methods (5min) Relationship between nuclear power generation and radiation(5min) Cloud chamber experiment (20min) Understanding radiation(5min) [Total 45min]
Grade 9 (15 years old)	Geography	Various regions of Japan (2) Japan's regional characteristics and regional classification 1. Instruct students to acquire the following knowledge and skills. <ul style="list-style-type: none"> Current status of resource and energy use in Japan Domestic industry trends Issues related to the environment and energy Understanding the characteristics of Japan's resources, energy, and industry 	<ul style="list-style-type: none"> Issues regarding energy self-sufficiency rate of Japan(10min) Importance of the energy best mix(5min) Overview of nuclear power generation(5min) Explanation of the relationship between nuclear power generation and radiation(5min) Cloud chamber experiment (15min) Radiation observation (5min) Understanding the natural radiation and types of radiation(5min) [Total 50min]

Future Scope
 As a member of JVET (Japanese Volunteer's Expert Team) , RADO plans to compile a text of Educational Application of Cloud Chambers Targeting Each Generation Level.

