

# Study of fluorescence for cryogenic fine-grain emulsion



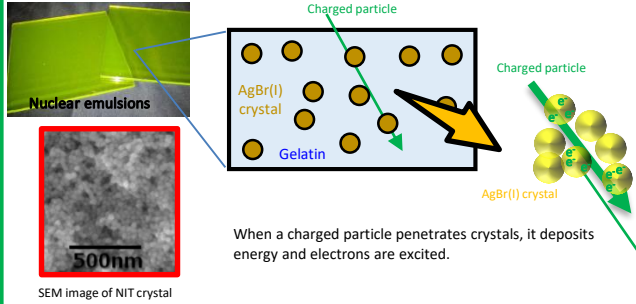
NAGOYA UNIVERSITY

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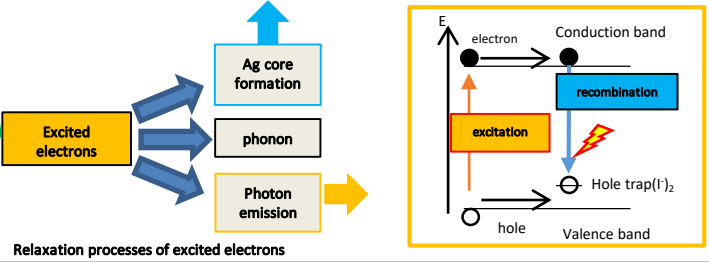
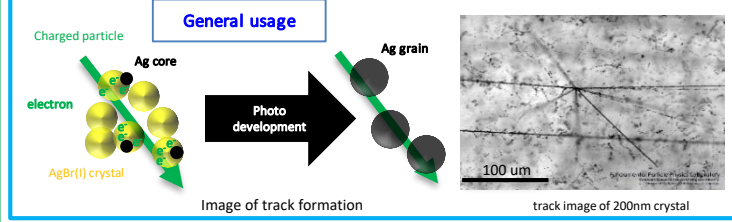
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## Nuclear emulsion and destination of excited electrons

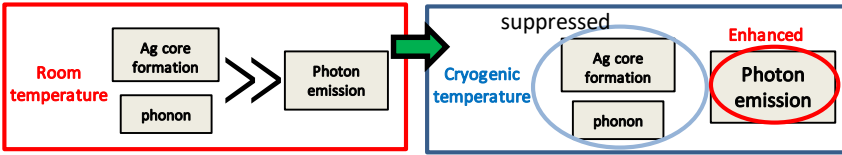
Nuclear emulsion is a solid detector which contains gelatins and AgBr(I) crystals and records charged particles as tracks.



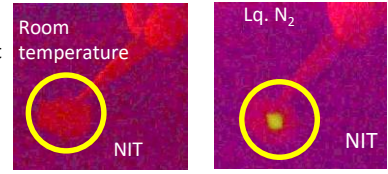
We have emulsion production machines and can control crystal size. In this study, we use emulsion with about 40nm crystals, called Nano Imaging Tracker(NIT), developed for directional dark matter search, because it shows stronger light emission than emulsion with other crystal size (20nm or 200nm) from the result of easy test.



## Temperature dependence of relaxation processes



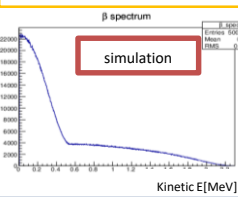
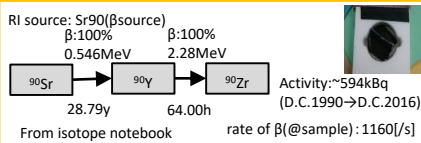
Test experiment  
 $\alpha$   
 $^{241}\text{Am}$



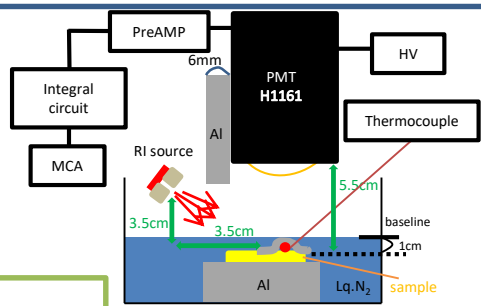
Thermal luminescence

Photographic scientists prove this tendency at 77K or 4K, but they use light source or rubbing to excite electrons.

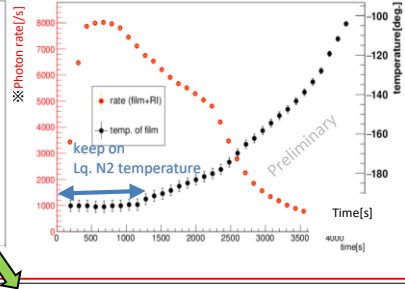
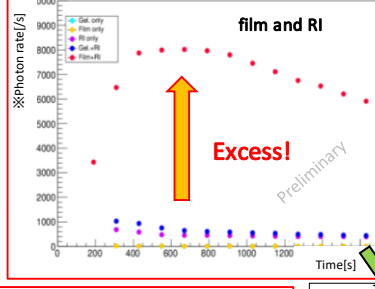
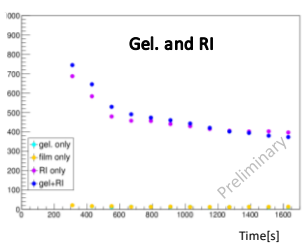
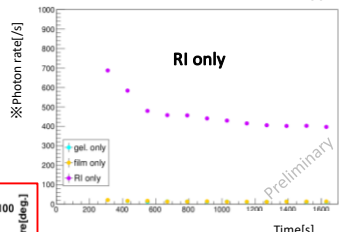
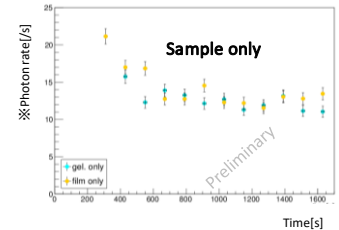
## Measurement system



- Procedure of measurement**
- Pour Lq. N<sub>2</sub> until the baseline
  - Supply HV to PMT
  - To count photons by MCA for 20s every 2min.



**samples**  
film : NIT(crystal + gelatin) 150um  
Gel.: gelatin 80um (60% of film is gel.)



results

**Attention**  
Raw signals from PMT are integrated, so rate 1 doesn't always consistent with 1 photon.

Under some assumptions, 1000 photons are generated by 1 beta-ray, and 7of them are detected in current setup.

## Acknowledgements

- We would like to thank Nagoya University program for LGS for the MCA, japan.
- We would like to thank Technical Center of Nagoya University for digital multimeter, Japan

## -Next plan-

We want to use nuclear emulsion as a **scintillation detector** (e.g. event position trigger for large scale experiment, possibility of particle identification). As a next step, we will measure the time constant of this fluorescence. At that time, main back ground should be thermal noise of the photo detector. Assuming that thermal noise rate is 1kHz, we hope that the time constant < 100μ conservatively.