

Development of automatic alpha-decay track measurement

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For analysis of double- Λ hypernucleus in nuclear emulsion, it is necessary to know shrinkage factor and density of emulsion plate by measuring the track ranges of alpha particles.

The kinetic energies of nuclear fragment from double- Λ hypernucleus are measured by their ranges in the emulsion, which is dedicated photographic emulsion for nuclear physics. Then we have to reconstruct their original ranges since the emulsion plate shrinks about half in thickness after development. Besides, we have to calibrate range-energy relation because the density depends on the emulsion content of moisture. Therefore we use alpha-rays with monochromatic energy as calibration sources which were emitted from natural RI such as Thorium series in the emulsion.

Technique which performs alpha-tracks measurement by image processing is being studied. In the E07 experiment at J-PARC [1], quick analysis is required for about 10^4 alpha tracks on about 100 double- Λ hypernuclear events within a few years. At present, we are developing automated range measurement technique instead of traditional manual measurement. Alpha tracks are seen as black, bold lines in micrographs as shown in Fig.1 and 2. Image processing program detects such lines and the positions, angles, ranges of them in micrographs.

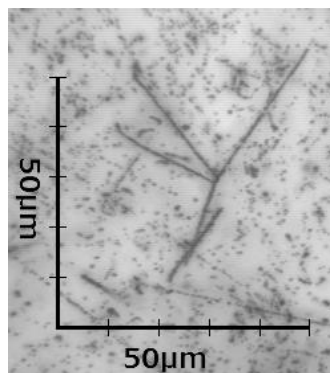


Fig 1. Photograph of alpha decays of thorium series

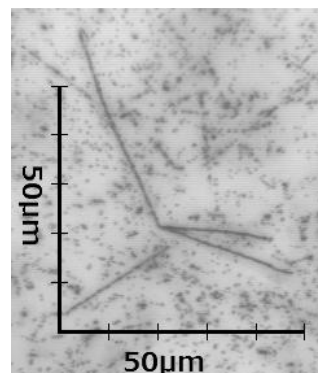


Fig 2. Photograph of alpha decays of uranium series

References

- [1] K. Imai et al., [http://j-parc.jp/researcher/Hadron/en/pac_0606/pdf/p07-Nakazawa.pdf].