Isotope Identification in Nuclear Emulsion Plate

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We have carried out the E373 experiment at KEK and detected 7 double-hypernuclear events.   Among them, however, only the Nagara event was uniquely identified as $_{\Lambda\Lambda}^{6}$He hypernucleus. To identify nuclide of $\sim 10^{2}$ or more double-hypernuclei in the J-PARC E07 experiment, it is necessary to know nuclear species of daughter isotopes from decay of double-hypernuclei in nuclear emulsion plates.

We are developing a PID method which identifies daughter isotopes by the measurement of energy losses as their track thickness in the emulsion.   In Fig.1, it is shown for the relation between dE/dx in the emulsion to track ranges for several isotopes from stopping point. Track width will be measured from stopping point up to ~ 100 μm with image processing method.   Under the assumption of tracks to be made of many cylinders by length of 1μm, track 'volume' given by width is summed up and expected to present differences as shown in Fig. 2.   Recently, we have proposed an experiment for exposing nuclear emulsion to particles Z = 1~ 5 at RIPS in RIKEN.

In this paper, we present the test result of the above PID method applied for fast protons from heavy double-hypernuclei decay in the emulsion of E373 experiment.
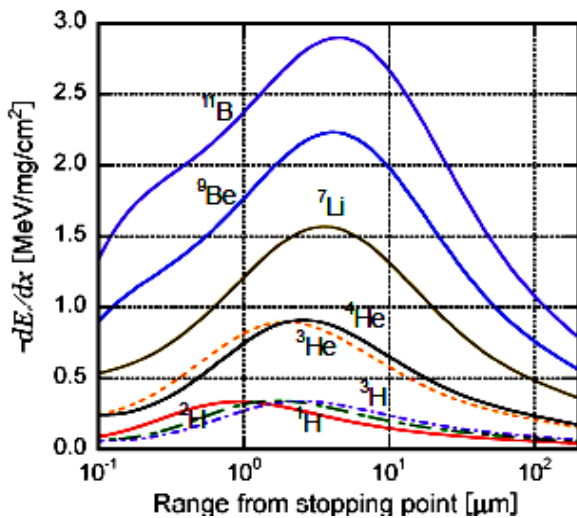

Fig 1. Calculated energy-loss for ^{1}H, ^{2}H, ^{3}H, ^{3}He, ^{4}He, ^{7}Li, ^{9}Be and ^{11}B corresponding to ranges from their stopping points in nuclear emulsion.
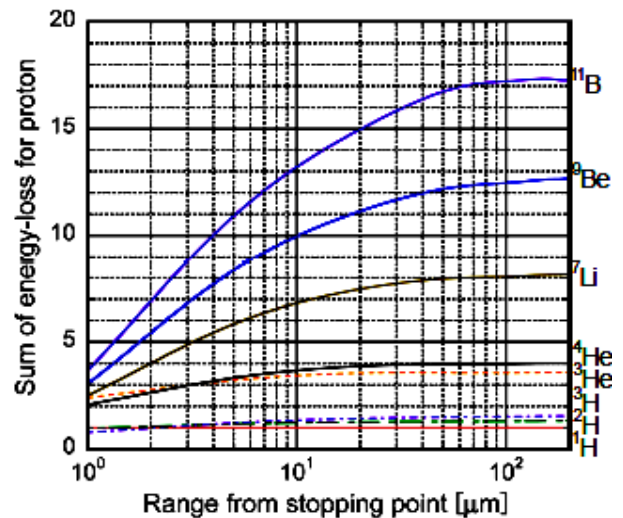
Fig 2. Relative values of sum of energy-loss for ^{1}H.