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Development of Real time ^{90}Sr counter applying Cherenkov light detection

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Radioisotope have been emitted around Japan by a nuclear accident at the Fukushima No. 1 nuclear power plant in March 2011. A problem is the contaminated water including the atomic nucleus which relatively has a long half-life time such as ^{90}Sr , ^{137}Cs generated from ^{235}U used for nuclear fuel in particular. Particular, since ^{90}Sr has a long biological half-life time (49 years), it is dangerous to cause internal exposure. Therefore, real-time ^{90}Sr counter is required. It is relatively easy to identify a nucleus emitting gamma ray. But it is more difficult to identify a nucleus emitting pure beta ray such as ^{90}Sr . Typically, measurement of a radioactivity absolute value of ^{90}Sr takes a month at least to give a result. At first, we aim to identify $^{90}\text{Sr}/^{137}\text{Cs}$ by threshold type Cherenkov detection. It needs radiator which has less than 1.0492 of refractive index for identification 2.28 MeV of maximum kinematic energy of beta ray from ^{90}Sr and 1.17 MeV of maximum kinematic energy of beta ray from ^{137}Cs . Recent, The material satisfying this request does not exist except the silica aerogel. We produced prototype and evaluated performance. We achieved 10^{-3} of Sr/Cs detection efficiency ratio, 10^{-3} Hz/ Bq of ^{90}Sr sensitivity at one minute.

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