

# Half-life measurement of 107-keV isomeric state in $^{45}\text{Cr}$

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An isomeric state of  $^{45}\text{Cr}$  with an excitation energy of 107 keV is of much interest for its nuclear structure in terms of the isospin symmetry. The mirror nucleus of  $^{45}\text{Cr}$ ,  $^{45}\text{Sc}$ , has an isomeric state. The isomeric state of  $^{45}\text{Sc}$  ( $J^\pi = 3/2^+$ ,  $E_x = 12.4$  keV,  $T_{1/2} = 325.8$  ms), has been well investigated. However, the half-life of the isomeric state of  $^{45}\text{Cr}$  was not measured. In the previous research, the lower limit of the half-life was only estimated several hundred  $\mu\text{s}$ .

We carried out the delayed gamma-ray spectroscopy as part of the SHARAQ13 collaboration of the mass measurement with TOF-Brho method.

A secondary beam consisting of various proton-rich isotopes in the pf-shell region was produced by the fragmentation of a  $^{78}\text{Kr}$  primary beam accelerated at 345 MeV/nucleon impinging on a  $^9\text{Be}$  target with a thickness of  $2.2$  g/cm<sup>2</sup>.

The beam was implanted into an active stopper of two plastic scintillators downstream of the final focal plane (S2) of SHARAQ spectrometer. For the delayed gamma-ray spectroscopy, the active stopper was surrounded by two HPGe detectors located vertically to the beamline.

The energy and timestamp information of gamma rays were recorded by a DAQ system equipped with digital signal processor, operating in a self-trigger mode.

This system enables us to associate the heavy-ion events with and gamma-ray events without any constraints on the time window.

We successfully measured the half-life of the 107-keV isomeric state of  $^{45}\text{Cr}$  and deduced the reduced transition strength of the isomeric decay, for the first time. In this presentation, we will discuss the spin and parity of the isomeric state and the isospin symmetry of pf shell in comparison with the theoretical predictions.

## Presentation type

**Primary author:** Ms AMITANI, Mei

**Co-authors:** Mr FUKUSHIMA, Chihaya (Tokyo City University); Dr MICHIMASA, Shin'ichiro (Center for Nuclear Study, the Univ. of Tokyo); Dr NISHIMURA, Daiki (Tokyo City University); Mr NAKAMURA, Yuki (Tokyo City University)

**Presenter:** Ms AMITANI, Mei

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