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Decay Data Evaluation for Radionuclide ^7Be

Zhou Chunmei Huang Xiaolong

(China Institute of Atomic Energy, CIAE)

^7Be is a radionuclide of ϵ decay. It can be useful as standard source of gamma-ray detector calibration. Therefore, its half-live and gamma-ray emission probability need to be known with good accuracy. The decay data were evaluated^[1] in 1988. It is important for us to update them. The cutoff date of references retrieved from Nuclear Science References File (NSRF) is November, 1996.

1 Half-live

The measured half-lives are listed in Table 1. In this evaluation it is noted that variation of half-live with chemical environment ranges up to 0.2% and a proposal to the nuclear structure and decay data evaluator network—a limitation of relative statistical weights is adopted. Weighted mean value 53.26 ± 0.05 days is recommended.

Table 1 Measured half-live for ^7Be

Value (in days)	Reference
53.12 ± 0.07	Jeager et al.(1996) ^[2]
$53.29 \pm 0.02^{\&}$	Merritt et al.(1974) ^[3]
53.17 ± 0.07	Lagoutiue et al.(1975) ^[4]
53.52 ± 0.10	Johlige et al.(1970) ^[5]
53.61 ± 0.17	Kraushaar et al.(1953) ^[6]
53.50 ± 0.20	Wright et al.(1957) ^[7]
52.93 ± 0.20	Segre et al.(1951) ^[8]
53.00 ± 0.40	Bouchez et al.(1956) ^[9]
53.10 ± 0.30	England et al.(1965) ^[10]
53.00 ± 0.30	Cressy et al.(1974) ^[11]
53.22 ± 0.08	unweighted mean
53.26 ± 0.05	weighted mean

Notes to Table:

&: This value is the latest one for authors. The uncertainty was increased to 0.04 to ensure that this value did not contribute a weighting of greater than 50% in weighted mean calculation.

2 Emission Probability of Gamma-ray

^7Be is ϵ decay to ground state and the first excited state (477.62097 keV) of ^7Li . Only 477.6035 keV gamma-ray can be emitted. The measured gamma-ray emision probability is listed in the Table 2. $P_{\gamma} = 10.45 \pm 0.05$ is recommended.

Table 2 Measured 477.6 keV gamma-ray emission probability

Value ^{\$} , %	Reference
10.32 ± 0.16	Taylor et al.(1962) ^[12]
10.42 ± 0.18	Poentiz et al.(1973) ^[13]
10.35 ± 0.08	Goodier et al.(1974) ^[14]
10.10 ± 0.45	Balamuth et al.(1983) ^[15]
10.61 ± 0.23	Davids et al.(1983) ^[16]
10.60 ± 0.50	Donoghue et al.(1983) ^[17]
10.61 ± 0.17	Fisher et al.(1984) ^[18]
10.70 ± 0.20	Methews et al.(1983) ^[19]
9.80 ± 0.50	Norman et al.(1983) ^[20]
10.90 ± 0.50	Donald et al.(1983) ^[21]
10.40 ± 0.70	Evans et al.(1984) ^[22]
10.49 ± 0.07	Skelten et al.(1984) ^[23]
10.440 ± 0.083	unweighted mean
10.450 ± 0.044	weighted mean

Notes to Table:

\$: Absolute emission probability for 477.6 keV gamma-ray per 100 parent decays.

3 Decay Scheme

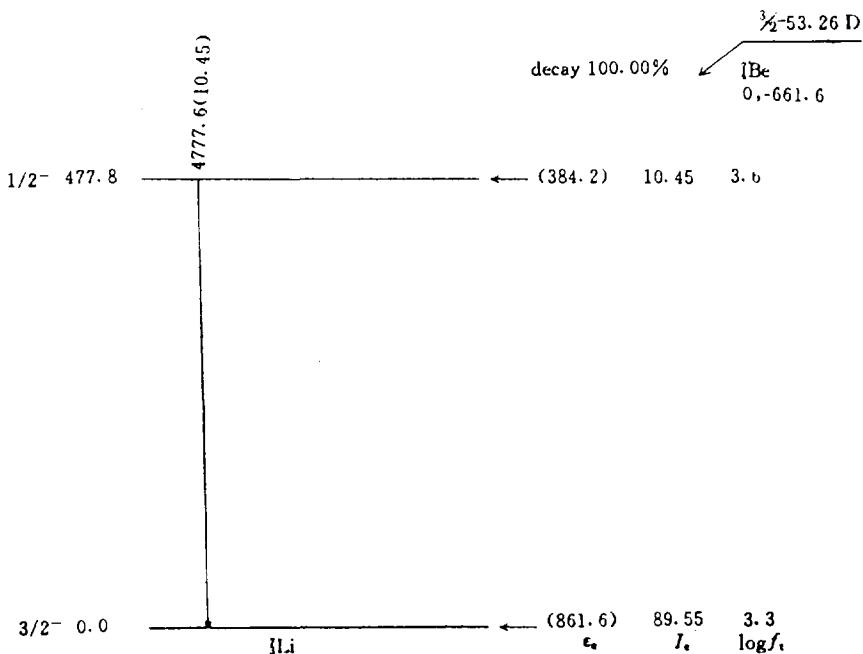


Fig.1 Decay scheme of ${}^7\text{Be}$

The decay scheme for ${}^7\text{Be}$ radionuclide is shown in the Fig.1. The decay energy $Q(\text{EC})=861.82 \pm 0.02$ keV^[24]. The EC branching ratios P_e (to ground state of

${}^7\text{Li})=89.55\pm 0.05$ and $P_{\gamma}(\text{to } 477.6 \text{ keV state of } {}^7\text{Li})=10.45\pm 0.05$ are deduced from %EC=100 for ${}^7\text{Be}$ and $P_{\gamma}(477.6 \text{ keV gamma-ray})=10.45\pm 0.05$. The $\log ft$ values are calculated by LOGFT code. The level energy $E_l=477.62095\pm 0.00020 \text{ keV}$ is calculated by using least-squares fitting to E_{γ} and nuclear recoil correction. Our recommended decay data for ${}^7\text{Be}$ are listed in Table 3.

Table 3 Recommended decay data for ${}^7\text{Be}$

Decay type/ray	energy, keV	Intensity ^a
EC 1		10.45 ± 0.05
EC 2		89.55 ± 0.05
γ 1	477.6035 ± 0.0002	10.45 ± 0.05

Notes to Table:

^a: Absolute intensity per 100 parent decays.

4 Comparison with other Evaluations

The evaluated half-live comparison is listed in Table 4.

Table 4 Evaluated half-live comparison for ${}^7\text{Be}$

$T_{1/2}$, days	Reference
53.26 ± 0.05	this work
53.29 ± 0.07	Ajzenberg-selove(1988) ^[1]
53.23 ± 0.06	Horiguchi et al.(1992) ^[25]
53.29 ± 0.07	Firestone et al.(1996) ^[26]
53.3 ± 0.1	Lederer et al(1978) ^[27]

The comparison of evaluated emission probability of gamma-ray is listed in Table 5.

Table 5 Comparison of evaluated gamma-ray absolute intensity for ${}^7\text{Be}$

$P_{\gamma}^{\#}, \%$	Reference
10.45 ± 0.05	this work
10.60 ± 0.20	Horiguchi et al.(1992) ^[25]
10.52 ± 0.06	Firestone et al.(1996) ^[26]
10.52 ± 0.06	Ajzenberg-selove(1988) ^[1]

Notes to Table:

[#]: Absolute emission probability for 477.6 KeV gamma-ray per 100 parent decays

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