^{142}Pr – Comments on evaluation of decay data
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Evaluated: June 2014, April 2015, January 2017

Evaluation Procedures

Limitation of Relative Statistical Weight Method (LWM) and other analytical techniques were applied to average numbers throughout the evaluation. The uncertainty assigned to the average value was always greater than or equal to the smallest uncertainty of the values used to calculate the average, unless stated otherwise.

Decay Scheme

^{142}Pr ($T_{½}$ = 19.14 h) undergoes 99.9836% β^- decay ($Q(\beta^-)$ = 2161.6 (15) keV) via two excited levels and the ground state of ^{142}Nd, and 0.0164% EC decay (Q(EC) = 744.5 (24) keV) via one excited level and the ground state of ^{142}Ce. A reasonably simple decay scheme was derived from the studies of 1968Hi07 and 1968Ra04, defined in terms of three β^- emissions, two EC transitions and three gamma rays.

Nuclear Data

Sound quantification of the 2161.6-keV β^- and 1575.77-keV γ-ray emissions in the β^- decay of ^{142}Pr is of importance in defining shielding requirements immediately after fuel irradiation.

Half-life

Half-life measurements of 1942De07, 1966Ot03, 1968La17 and 1989Ab05 were adopted to give a weighted-mean value of (19.14 ± 0.04) hours, based on the LWM-NRM-Rajeval analysis techniques.

Reference	Half-life (h)
1942De07	19.3 ± 0.1
1950Je56	19.1*
1966Ot03	19.14 ± 0.05
1968La17	19.09 ± 0.07
1989Ab05	19.140 ± 0.002‡
Recommended value	19.14 ± 0.04†

* Uncertainty unspecified – not included in weighted mean analysis of the data set.
‡ Assigned uncertainty was judged to be over-optimistic, and was adjusted from ± 0.002 to 0.04 to reduce weighting to no more than 50%.
† Recommended uncertainty adjusted from ± 0.03 to 0.04, in alignment with the smallest uncertainty of the values used to calculate the weighted-mean value.

A half-life of (19.14 ± 0.04) hours is recommended, as quantified by the LWM-NRM analytical procedures.

Q value

$Q_{\beta-}$-value of 2161.6 (15) keV and Q_{EC}-value of 744.5 (24) keV were adopted from Wang *et al.* (2012Wa38).

Gamma-ray energies and emission probabilities

Energies

The well-defined nuclear level energies of 2011Jo05 were used to calculate the gamma transition energies and their uncertainties, and these data were adjusted to account for gamma recoil in the formulation of recommended gamma-ray emission energies and uncertainties. Greater confidence was placed in this approach because of the more wide-ranging origins of the level energies compared with the measured gamma-ray decay data, even though the energies of the three gamma-ray emissions have been directly measured by 1968Hi07 and 1968Ra04. A half-life of 14.6 (5) minutes for ^{142m}Pr was adopted from the measurements of Kern et al. (1967Ke05, 1968Ke08), along with a minimum half-life for α decay of the ^{142}Ce ground state of > 5 x 10^{16} years (defined to be stable) as determined from the measurements of

1959Se49 and 1961Ma05, while other nuclear-level half-lives were determined from half-life, mean lifetime and B(E2) studies by 1975Sc17, 1989Sp07, 1993Be03, 1995Be41 and 2001Ra27.

Adopted energies, spins, parities and half-lives for the relevant nuclear levels of ^{142}Pr, ^{142}Ce and ^{142}Nd (2011Jo05).

	Nuclear level number*	Nuclear level energy (keV)	Spin and parity	Level half-life
^{142}Pr	0	0.0	2 −	(19.14 ± 0.04) h
	1	3.694 ± 0.003	5 −	(14.6 ± 0.5) min*
		90.3 ± 0.9	(6 −)	
		358.4 ± 0.9	(7 −)	
		911.4 ± 1.3	(9 +)	61 (6) ns†
^{142}Ce	0	0.0	0 +	stable (> 5 x 10^{16} y)
	1	641.282 ± 0.009	2 +	5.40 (7) ps#
^{142}Nd	0	0.0	0 +	stable
	1	1575.780 ± 0.010	2 +	0.110 (2) ps¶
	2	2083.940 ± 0.020	3 −	0.44 (+37, -14) ps‡

* As measured by Kern *et al*. (1967Ke05, 1968Ke08).
† As measured by Schedl *et al*. (1975Sc17).
# As determined in B(E2) measurements of Spear *et al*. (1989Sp07), and by the analyses of Raman *et al*. (2001Ra27).
¶ As measured by Belgya *et al*. (1993Be03, 1995Be41), and analysed by Raman *et al*. (2001Ra27).
‡ As measured by Belgya *et al*. (1995Be41).

Transition and gamma-ray energies for β^- and EC decay of ^{142}Pr (2011Jo05).

		Transition energy (keV)	Gamma-ray energy, E_γ (keV)
$\gamma_{2,1}$	(Nd)	508.160 (22)	508.159 ± 0.022
$\gamma_{1,0}$	(Ce)	641.282 (9)	641.280 ± 0.009
$\gamma_{1,0}$	(Nd)	1575.780 (10)	1575.771 ± 0.010

Half-life of ^{142}Ce (α decay).

Reference	Half-life (years)
1957Ri43	(5.1 ± 2.5) x 10^{15}†
1959Se49	> 10^{16}‡
1961Ma05	> 5 x 10^{16}¶
Recommended value	> 5 x 10^{16}*

† Estimated uncertainty – half-life judged by 1957Ri43 as uncertain by a factor of two.
‡ No α tracks assigned to $^{142}CeO_2$ - estimated minimum half-life for α decay of 10^{16} years.
¶ Inconclusive α spectrum in contradiction to 1957Ri43 - estimated minimum half-life for α decay of 5 x 10^{16} years.
* Recommended minimum half-life for α decay of 5 x 10^{16} years, as specified by 1961Ma05 – ^{142}Ce defined as stable.

Measured and recommended gamma-ray energies.

Eγ (keV)					
1952Je13	**1954Po26**	**1955St51**	**1968Hi07**	**1968Ra04**	**Recommended#**
−	−	−	508.1 (8)	508.8 (5)	508.159 ± 0.022
−	−	−	−	642.0 (10)	641.280 ± 0.009
1570 (60)	1572 (8)	1580	1575.9 (2)	1575.6 (5)	1575.771 ± 0.010

Determined from the nuclear level energies of 2011Jo05.

Emission probabilities

The small set of relative emission probabilities were suitably quantified in terms of the emission probability of the 1575.77-keV gamma ray (100.0%). Relative gamma-ray emission probabilities were determined in the studies of 1968Hi07 and 1968Ra04, while an absolute emission probability of 3.68 (42) % has been measured for the 1575.77-keV gamma ray by 1963Me15 – this value was used directly to calculate the normalization factor for the recommended relative emission probabilities of the gamma rays:

$$P_\gamma^{abs}(1575.77\ keV) \ = \ 3.68(42) \ = \ 100\,F$$

where F is the normalization factor

F = 3.68 (42) / 100 = 0.0368 (42) = 0.037 ± 0.004

Multipolarities, and Internal-Conversion and Internal-Pair Formation Coefficients

The nuclear level scheme specified by Johnson et al. has been used to define the multipolarities of the gamma transitions on the basis of the known spins and parities (2011Jo05). Adopted multipolarities are 100%E1 for the 508.159-keV gamma ray, and 100%E2 for the 641.280- and 1575.771-keV gamma rays.

Recommended internal conversion coefficients have been determined from the frozen orbital approximation of Kibédi *et al*. (2008Ki07), based on the theoretical model of Band *et al*. (2002Ba85, 2002Ra45). The 1575.771-keV gamma ray undergoes internal-pair formation, and the coefficient for this process has also been quantified from the tabulations of 2008Ki07.

Measured and recommended gamma-ray emission probabilities relative to P_γ(1575.77 keV) of 100.

Eγ (keV)	P_γ^{rel} (%)		
	1968Hi07	**1968Ra04**	**Recommended**[#]
508.159 ± 0.022	0.67 (3)	0.62 (5)	0.66 ± 0.03
641.280 ± 0.009	−	0.06 (2)	0.06 ± 0.02
1575.771 ± 0.010	100	100	100

[#] Weighted-mean value adopted when judged appropriate.

Recommended gamma-ray energies, transition probabilities, and relative and absolute emission probabilities.

		Eγ (keV)	P_γ^{rel} (%)	P_γ^{abs} (%)	Transition probability (%)
$\gamma_{2,1}$	(Nd)	508.159 ± 0.022	0.66 (3)	0.024 (3)	0.024 (3)
$\gamma_{1,0}$	(Ce)	641.280 ± 0.009	0.06 (2)	0.0022 (8)	0.0022 (8)
$\gamma_{1,0}$	(Nd)	1575.771 ± 0.010	100	3.7 (4)	3.7 (4)

EC and β⁻ branching fractions from measured EC/β⁻ branching ratio

Crocker et al. determined the EC/β⁻ branching ratio from mass abundance measurements undertaken by means of a single-focusing, 60° magnetic-sector mass spectrometer equipped with a triple-filament solid-sample source (1966Cr02). Potential sources of error from contamination by barium, lanthanum, cerium, praseodymium and neodymium were also addressed and eliminated.

Relative abundances of the cerium and neodymium nuclides were determined in order to quantify the amounts of ^{142}Ce and ^{142}Nd produced, respectively, by the EC and β⁻ decay of ^{142}Pr. The ratio of electron capture to β⁻ decay for ^{142}Pr was found to be (1.64 ± 0.08) x 10^{-4}.

β⁻ and EC-decay branches for ^{142}Pr can be calculated from the above:

$$BF_{EC} + BF_{\beta-} = 1.00 \qquad (1)$$

$$BF_{EC} / BF_{\beta-} = 0.000\,164\,(8), \text{ and } BF_{EC} = 0.000\,164\,(8) \times BF_{\beta-} \qquad (2)$$

Thus, substituting equation (2) into equation (1):

$$[1 + 0.000164\,(8)]BF_{\beta-} = 1.00$$

$$BF_{\beta-} = (0.999\,836 \pm 0.000\,008), \text{ and } BF_{EC} = (0.000\,164 \pm 0.000\,008)$$

These data were used in conjunction with the relative gamma-ray emission probabilities, total theoretical internal conversion coefficients and normalisation factor to calculate the absolute electron capture transition probabilities and β⁻ emission probabilities.

Gamma-ray emissions: multipolarities, and theoretical internal-conversion (frozen orbital approximation) and internal-pair formation coefficients.

		E_γ (keV)	Multi-polarity	α_K	α_L	α_{L1}	α_{L2}	α_{L3}	α_{M+}	$\alpha_{totalICC}$	α_{IPF}	α_{total}
$\gamma_{2,1}$	(Nd)	508.159 ± 0.022	E1	0.003 26 (5)	0.000 424 (6)	0.000 378 (6)	0.000 021 2 (3)	0.000 024 6 (4)	0.000 116	0.003 80 (6)	−	0.003 80 (6)
$\gamma_{1,0}$	(Ce)	641.280 ± 0.009	E2	0.004 75 (7)	0.000 695 (10)	0.000 556 (8)	0.000 086 0 (12)	0.000 052 8 (8)	0.000 185	0.005 63 (8)	−	0.005 63 (8)
$\gamma_{1,0}$	(Nd)	1575.771 ± 0.010	E2	0.000 772 (11)	0.000 100 5 (14)	0.000 093 0 (13)	0.000 004 80 (7)	0.000 002 70 (4)	0.000 026 6	0.000 899 (11)	0.000 103 7 (15)*	0.001 003 (14)

* Internal-pair formation coefficient of 0.000 108 (18) determined by 1961La15.

β⁻ energies and emission probabilities

Energies

All β^- energies were derived from the structural details of the proposed decay scheme. The nuclear level energies of 2011Jo05 and evaluated Q-value of 2161.6 (15) keV (2012Wa38) were used to determine the recommended energies and uncertainties of the β^- emissions.

Emission Probabilities

Various efforts have been made to determine the absolute emission probability of the lower-energy β^- decay to the 1575.78-keV nuclear level of ^{142}Nd.

Measurements of the lower-energy β⁻ decay to the 1575.78-keV nuclear level of ^{142}Nd.

Reference	P_{γ}^{abs} (%)
1955St51	2.8 (4)
1959Fr52	3.7 (4)
1961La15	3.7 (4)

^{142}Pr undergoes 99.9836 (8) % β^- decay. Three β^- emission probabilities were derived from the population-depopulation imbalances of the relative emission probabilities of the two gamma rays (508.159 and 1575.771 keV), their theoretical internal-conversion coefficients, and a normalization factor of (0.037 ± 0.004), as noted above. Agreement was observed between the absolute P_β value calculated in this manner for the 585.8-keV β^- emission and the equivalent measurements of 1959Fr52 and 1961La15 (3.7 (4) %). Log*ft* values and average $E_{\beta-}$ energies were determined by means of the LOGFT code.

Recommended energies and emission probabilities for the β⁻ decay of ^{142}Pr.

	E_β (keV)*	Av. $E_{\beta-}$ (keV)	P_β	^{142}Pr	^{142}Nd	transition type	log *ft*
$\beta^-_{0,2}$	77.7 (15)	20.1 (4)	0.024 (3)	2 −	3 −	allowed	6.5
$\beta^-_{0,1}$	585.8 (15)	182.5 (6)	3.7 (4)	2 −	2 +	first forbidden non-unique	7.09
$\beta^-_{0,0}$	2161.6 (15)	833.9 (7)	96.3 (4)	2 −	0 +	first forbidden unique	8.901^{1u}
			Σ 100.024				

* Determined from the nuclear level energies of 2011Jo05 and Q-value of 2161.6 (15) keV (2012Wa38).

A consistent partial decay scheme was derived that consists of three β^- transitions and two gamma-ray emissions, in which the dominant transition directly to the ground state of ^{142}Nd ($2^- \rightarrow 0^+$) was defined as first forbidden unique.

EC transitions

Energies

All EC transition energies were derived from the structural details of the proposed decay scheme. The nuclear level energies of 2011Jo05 and evaluated Q_{EC}-value of 744.5 (24) keV (2012Wa38) were used to determine the recommended energies and uncertainties of the EC transitions.

Transition and Emission Probabilities

^{142}Pr undergoes 0.0164% EC decay. The two resulting EC transition probabilities were derived from the EC branching ratio, relative emission probability of the single 641.28-keV gamma ray and theoretical internal-conversion coefficients. A recommended normalization factor of (0.037 ± 0.004) was used in order to determine the absolute EC transition probabilities from their resulting relative transition probabilities. Fractional EC probabilities P_K, P_L, P_M and P_N were calculated by means of the EC-CAPTURE code (1998Sc28) as developed from the data tabulations of 1995ScZY, while log*ft* values were determined from the LOGFT code. Thus, a partial decay scheme was derived that consists of two EC transitions and one gamma-ray emission.

The evaluation of the complete decay scheme for ^{142}Pr has revealed a paucity of comprehensive studies over the years. While a number of extremely significant measurements were undertaken from 1955 to 1968 (i.e. $P_{\beta-}$ (1955St51, 1959Fr52, 1961La15); absolute P_γ(1575.771 keV) (1963Me15); EC/β^- ratio (1966Cr02); and relative P_γ data (1968Hi07, 1968Ra04)), extensive confirmatory measurements are lacking beyond that fourteen-year period. Without some of the highly specific data published from 1955 to 1968, a reasonably consistent decay scheme could not have been constructed with any confidence.

Summation of $P_{\beta-}$ and P_{EC} = (100.024 + 0.0164)% = 100.0404%

Recommended energies and transition probabilities of the EC decay of ^{142}Pr.

	E_{EC} (keV)*	P_{EC}	^{142}Pr	^{142}Ce	transition type	log *ft*	P_K	P_L	P_M	P_N
$EC_{0,1}$	103.2 (24)	0.0022 (8)	2 −	2 +	first forbidden non-unique	7.9	0.7039 (60)	0.2270 (46)	0.0554 (15)	0.0137 (8)
$EC_{0,0}$	744.5 (24)	0.0142 (11)	2 −	0 +	first forbidden unique	9.42^{1u}	0.8398 (15)	0.1255 (11)	0.0280 (5)	0.0068 (4)
		∑ 0.0164 (14)								

* Determined from the nuclear level energies of 2011Jo05 and Q-value of 744.5 (24) keV (2012Wa38).

Atomic Data

The x-ray and Auger-electron data have been calculated using the evaluated gamma-ray data, and atomic data from 1996Sc06, 1998ScZM and 1999ScZX. Both the x-ray and Auger-electron emission probabilities were determined by means of the EMISSION computer program (version 4.02, 28 February 2012), as described in 2000Sc47. This program incorporates atomic data from 1996Sc06 and the evaluated gamma-ray data.

K and L X-ray energies and emission probabilities of ^{142}Pr.

			Energy (keV)	Photons per 100 disint.	Relative probability (%)
XL		(Ce)	4.289 – 6.342	0.001 79 (9)	
	XL_l	(Ce)	4.289	0.000 034 1 (25)	
	XL_α	(Ce)	4.822 – 4.840	0.000 87 (6)	
	XL_η	(Ce)	4.730	0.000 012 8 (10)	
	XL_β	(Ce)	5.263 – 5.613	0.000 75 (4)	
	XL_γ	(Ce)	6.054 – 6.342	0.000 122 (7)	
XK_α	$XK_{\alpha2}$	(Ce)	34.2793 (3)	0.003 5 (3)	55
	$XK_{\alpha1}$	(Ce)	34.7200 (2)	0.006 4 (6)	100
$XK'_{\beta1}$	$XK_{\beta3}$	(Ce)	39.1705 (5)	)	
	$XK_{\beta1}$	(Ce)	39.2578 (2)	) 0.001 92 (16)	30
	$XK''_{\beta5}$	(Ce)	39.549 (3)	)	
$XK'_{\beta2}$	$XK_{\beta2}$	(Ce)	40.233 (1)	)	
	$XK_{\beta4}$	(Ce)	40.337 (3)	) 0.000 49 (4)	7.7
	$XKO_{2,3}$	(Ce)	40.423	)	
XL		(Nd)	4.633 – 6.901	0.000 42 (3)	
	XL_l	(Nd)	4.633	0.000 008 2 (8)	
	XL_α	(Nd)	5.208 – 5.230	0.000 206 (17)	
	XL_η	(Nd)	5.146	0.000 003 1 (3)	
	XL_β	(Nd)	5.722 – 6.090	0.000 174 (12)	
	XL_γ	(Nd)	6.604 – 6.901	0.000 027 9 (20)	
XK_α	$XK_{\alpha2}$	(Nd)	36.8478 (3)	0.000 76 (9)	55
	$XK_{\alpha1}$	(Nd)	37.3614 (2)	0.001 39 (15)	100
$XK'_{\beta1}$	$XK_{\beta3}$	(Nd)	42.1670 (4)	)	
	$XK_{\beta1}$	(Nd)	42.2717 (3)	) 0.000 43 (5)	30.9
	$XK''_{\beta5}$	(Nd)	42.580	)	
$XK'_{\beta2}$	$XK_{\beta2}$	(Nd)	43.335 (3)	)	
	$XK_{\beta4}$	(Nd)	43.451	) 0.000 110 (12)	7.9
	$XKO_{2,3}$	(Nd)	43.548	)	

Auger-electron energies and emission probabilities of ^{142}Pr.

	Energy (keV)	Electrons per 100 disint.	Relative probability (%)
e_{AK} (Ce)		0.001 21 (12)	
KLL	27.190 – 28.828	0.000 78 (8)	100
KLX	32.392 – 34.700	0.000 38 (4)	48.7
KXY	37.57 – 40.40	0.000 047 (5)	6.03
e_{AL} (Ce)	2.81 – 4.72	0.012 3 (7)	1577
e_{AK} (Nd)		0.000 24 (3)	
KLL	29.154 – 30.978	0.000 154 (18)	100
KLX	34.798 – 37.340	0.000 077 (9)	50
KXY	40.42 – 43.53	0.000 009 6 (12)	6.23
e_{AL} (Nd)	3.01 – 5.10	0.002 51 (17)	1630

Ce: ω_K = 0.910 (4) ; ϖ_L = 0.125 (5) ; n_{KL} = 0.876 (4) and
Nd: ω_K = 0.918 (4) ; ϖ_L = 0.140 (6) ; n_{KL} = 0.866 (4) were taken from 1996Sc06.

Electron energies were determined from electron binding energies tabulated by Larkins (1977La19) and the evaluated gamma-ray energies. Absolute electron emission probabilities were calculated from the evaluated absolute gamma-ray emission probabilities and associated internal conversion coefficients.

Main Production Modes for ^{142}Pr and ^{142m}Pr

^{142}Pr: ^{141}Pr(n,γ)^{142}Pr, ^{141}Pr(d,p)^{142}Pr, ^{142}Ce(p,n)^{142}Pr, ^{142}Ce(d,2n)^{142}Pr, ^{139}La(α,n)^{142}Pr
^{142m}Pr: ^{141}Pr(n,γ)^{142m}Pr, ^{141}Pr(d,p)^{142m}Pr, ^{139}La(α,n)^{142m}Pr

Data Consistency

Q_β-value of 2161.6 (15) keV and Q_{EC}-value of 744.5 (24) keV were adopted from the atomic mass evaluation of Wang *et al*. (2012Wa38) while in the course of formulating the decay scheme of ^{144}Pr. These values have been used in conjunction with the branching fractions for BF_β of 0.999 836 (8) and BF_{EC} of 0.000 164 (8) to determine an overall Q-value of 2161.4 (15) keV to be compared with the Q-value calculated by summing the contributions of the individual emissions of the ^{144}Pr decay processes (i.e. β^-, electron, γ, etc.):

$$\text{calculated Q-value} = \sum (E_i \times P_i) = 2162\ (11)\ \text{keV}$$

Percentage deviation from the effective overall Q-value is − (0.03 ± 0.50)%, which supports the derivation of an extremely consistent decay scheme with a significant variant.

References

1942De07 J.W. DeWire, M.L. Pool, J.D. Kurbatov, Radioactive Isotopes of Praseodymium, Phys. Rev. 61 (1942) 564-567. [Half-life, Q_β]

1948Co23 J.M. Cork, R.G. Shreffler, C.M. Fowler, Converted Gamma-Radiation from Silver, Cadmium, Indium, Praseodymium and Rhenium, Phys. Rev. 74 (1948) 1657-1659. [E_γ]

1949Ma16 C.E. Mandeville, The Characteristic Radiations of Praseodymium (142), Phys. Rev. 75 (1949) 1017-1019. [E_β, P_β, E_γ]

1950Je56 E.N. Jensen, L.J. Laslett, D.J. Zaffarano, The Disintegration of Praseodymium 142, Phys. Rev. 80 (1950) 862-865. [Half-life, E_β, P_β, E_γ]

1952Je13 E.N. Jensen, L.J. Laslett, D.J. Zaffarano, Secondary Electron Spectrum of Pr^{142}, Phys. Rev. 86 (1952) 1047-1048. [Photoelectrons, Compton and Bremsstrahlung electrons]

1952Mo29 J. Moreau, J.P. Jorba, Étude des Spectres β^- de ${}^{90}_{39}Y, {}^{91}_{39}Y, {}^{142}_{59}Pr, {}^{86}_{37}Rb$, C.R. Acad. Sci., Paris 235 (1952) 38-40. [Q_β]

1954Po26 A.V. Pohm, W.E. Lewis, J.H. Talboy Jr., E.N. Jensen, Beta Spectra of Pr^{142}, Tm^{170} and Rb^{86}, Phys. Rev. 95 (1954) 1523-1529. [E_β, P_β, P_γ]

1955St51 M.J. Sterk, R.H. Nussbaum, H. Cerfontain, The Intensity of the Soft Second β-spectrum in ^{142}Pr, Physica 21 (1955) 541-542. [E_β, P_β low-energy branch, P_γ]

1957Ri43 W. Riezler, G. Kauw, Natürliche Radioaktivität von Cer 142, Z. Naturforsch. 12a (1957) 665-666. [^{142}Ce half-life (α decay)]

1959Fr52 E. Freiberg, K. Goebel, Das Verzweigungsverhältnis des $Praseodym^{142}$, Z. Naturforsch. 14a (1959) 679. [P_β low-energy branch]

1959Se49 F.E. Senftle, T.W. Stern, V.P. Alekna, α Radioactivity of Cerium-142, Nature 184 (1959) 630. [Lower limit of ^{142}Ce half-life (α decay)]

1961La15 H. Langhoff, P. Kilian, A. Flammersfeld, Die Koeffizienten der Inneren Paarbildung bei den γ-Übergängen nach $Co^{60} \rightarrow Ni^{60}$ und $Pr^{142} \rightarrow Nd^{142}$, Z. Phys. 165 (1961) 387-392. [Internal-pair formation, P_β low-energy branch]

1961Ma05 R.D. MacFarlane, T.P. Kohman, Natural Alpha Radioactivity in Medium-Heavy Elements, Phys. Rev. 121 (1961) 1758-1769. [Lower limit of ^{142}Ce half-life (α decay)]

1963Me15 M.P. Menon, Radiochemical Measurement of the Branching Ratio of Pr^{142} Decay, MIT-LNS Progress Report on Physics and Chemistry, NYO-10065 (1963) 37-38. [P_γ(1576 keV)]

1966Be12 H. Beekhuis, Anomalous Shape of the 1776-keV $0^- \rightarrow 2^+$ Beta Transition in the 27 h ^{166}Ho, Phys. Lett. 21 (1966) 205-206. [^{142}Pr first forbidden unique transition, Q_β]

1966Cr02 I.H. Crocker, R.D. Werner, W. Cherrin, The Electron Capture to Negative Electron Emission Branching Ratio for ^{142}Pr Decay, Can. J. Phys. 44 (1966) 409-414. [EC/β^- ratio]

1966Ot03 K. Otozai, S. Kume, M. Koyama, T. Mitsuji, T. Nishi, I. Fujiwara, Excitation Functions for the Reactions Induced by Deuterons on ^{142}Ce up to 14.2 MeV, Nucl. Phys. 81 (1966) 322-338. [Half-life]

1967Ke05 J. Kern, G. Mauron, B. Michaud, A New 15 min Isomer in ^{142}Pr, Phys. Lett. 24B (1967) 400-401. [^{142m}Pr half-life]

1968Hi07 J.C. Hill, M.L. Wiedenbeck, Some New Features in the Decay of ^{142}Pr, Nucl. Phys. A113 (1968) 598-602. [E_γ, P_γ]

1968Ke08 J. Kern, G.L. Struble, R.K. Sheline, E.T. Jurney, H.R. Koch, B.P.K. Maier, U. Gruber, O.W.B. Schult, Nuclear Levels in ^{142}Pr, Phys. Rev. 173 (1968) 1133-1158. [^{142m}Pr half-life, ^{142}Pr nuclear levels]

1968La17 J. Lange, H. Münzel, Bestimmung einiger Anregungsfunktionen für Deuteronenreaktionen mit ^{141}Pr, Radiochim. Acta 9 (1968) 66-71. [Half-life]

1968Ra04 S. Raman, The Decay of ^{142}Pr to ^{142}Ce and ^{142}Nd, Nucl. Phys. A113 (1968) 603-607. [E_γ, P_γ]

1975Ra09 C.N. Rao, B.M. Rao, P.M. Rao, K.V. Reddy, Precision Measurement of the Shapes of the First-forbidden Unique Beta Spectra: ^{42}K, ^{142}Pr, ^{86}Rb and ^{91}Y, Phys. Rev. C11 (1975) 1735-1739. [Shape of ground state first forbidden unique transition, Q_β]

1975Sc17 K.H. Schedl, C. Bercks, E. Hummel, Untersuchungen Isomerer Übergänge in ^{140}Pr und ^{142}Pr, Z. Phys. A272 (1975) 417-420. [^{142}Pr nuclear levels]

1977La19 F.P. Larkins, Semiempirical Auger-electron Energies for Elements 10 ≤ Z ≤ 100, At. Data Nucl. Data Tables 20 (1977) 311-387. [Auger-electron energies]

1989Ab05 A. Abzouzi, M.S. Antony, V.B.N. Ndongué, Precision Measurements of the Half-lives of Nuclides, J. Radioanal. Nucl. Chem. 135 (1989) 1-7. [Half-life]

1989Sp07 R.H. Spear, W.J. Vermeer, S.M. Burnett, G.J. Gyapong, C.S. Lim, Coulomb Excitation of ^{142}Ce and ^{144}Nd, Australian J. Phys. 42 (1989) 345-363. [B(E2)]

1993Be03 T. Belgya, D. Seckel, E.L. Johnson, E.M. Baum, D.P. DiPrete, D. Wang, S.W. Yates, Level Lifetimes in N = 82 Isotopes from Doppler-shift Attenuation Method Mixed-target Measurements, Phys. Rev. C47 (1993) 393-394. [Lifetimes of ^{142}Nd levels]

1993Ni17 K. Nishimura, I.S. Oliveira, N.J. Stone, Y. Isikawa, K. Shimizu, K. Sato, Hyperfine Field and Beta-decay of ^{142}Pr in PrNi Studied by Low Temperature Nuclear Orientation, Hyperfine Interactions 78 (1993) 153-157. [Hyperfine field, β decay]

1995Be41 T. Belgya, R.A. Gatenby, E.M. Baum, E.L. Johnson, D.P. DiPrete, S.W. Yates, B. Fazekas, G. Molnár, Two-phonon Character of the Lowest $J^\pi = 1^-$ State of ^{142}Nd, Phys. Rev. C52 (1995) R2314-R2316. [Lifetimes of ^{142}Nd levels]

1995ScZY E. Schönfeld, Tables for the Calculation of Electron Capture Probabilities, PTB Report PTB-6.33-95-2, 1995. [P_K, P_L, P_M, P_N, P_O]

1996Sc06 E. Schönfeld, H. Janβen, Evaluation of Atomic Shell Data, Nucl. Instrum. Methods Phys. Res. A369 (1996) 527-533. [ω_K, ϖ_L, K_β/K_α, $K_{\alpha 2}/K_{\alpha 1}$, KLX/KLL, KXY/KLL]

1998Sc28 E. Schönfeld, Calculation of Fractional Electron Capture Probabilities, Appl. Radiat. Isot. 49 (1998) 1353-1357. [P_K, P_L, P_M, P_N, P_O]

1998ScZM E. Schönfeld, G. Rodloff, Tables of the Energies of K-Auger Electrons for Elements with Atomic Numbers in the Range from Z = 11 to Z = 100, PTB Report PTB-6.11-98-1, October 1998. [Auger electrons]

1999ScZX E. Schönfeld, G. Rodloff, Energies and Relative Emission Probabilities of K X-rays for Elements with Atomic Numbers in the Range from Z = 5 to Z = 100, PTB Report PTB-6.11-1999-1, February 1999. [X_K]

2000Sc47 E. Schönfeld, H. Janβen, Calculation of Emission Probabilities of X-rays and Auger Electrons Emitted in Radioactive Disintegration Processes, Appl. Radiat. Isot. 52 (2000) 595-600. [P_X, P_{Ae}]

2001Ra27 S. Raman, C.W. Nestor Jr., P. Tikkanen, Transition Probability from the Ground State to the First-Excited 2^+ State of Even-Even Nuclides, At. Data Nucl. Data Tables 78 (2001) 1-128. [B(E2), Mean lifetime of 641.28 keV nuclear level of ^{142}Ce]

2002Ba85 I.M. Band, M.B. Trzhaskovskaya, C.W. Nestor Jr., P.O. Tikkanen, S. Raman, Dirac–Fock Internal Conversion Coefficients, At. Data Nucl. Data Tables 81 (2002) 1-334. [ICC]

2002Ra45 S. Raman, C.W. Nestor Jr., A. Ichihara, M.B. Trzhaskovskaya, How Good are the Internal Conversion Coefficients Now? Phys. Rev. C66 (2002) 044312, 1-23. [ICC]

2008Ki07 T. Kibédi, T.W. Burrows, M.B. Trzhaskovskaya, P.M. Davidson, C.W. Nestor Jr., Evaluation of Theoretical Conversion Coefficients using BrIcc, Nucl. Instrum. Methods Phys. Res. A589 (2008) 202-229. [ICC]

2011Jo05 T.D. Johnson, D. Symochko, M. Fadil, J.K. Tuli, Nuclear Data Sheets for A = 142, Nucl. Data Sheets 112 (2011) 1949-2127. [Nuclear levels]

2012Wa38 M. Wang, G. Audi, A.H. Wapstra, F.G. Kondev, M. MacCormick, X. Xu, B. Pfeiffer, The AME2012 Atomic Mass Evaluation, (I). Tables, Graphs and References, Chin. Phys. C36 (2012) 1603-2014. [Q-values]