Coulomb excitation 1980La01,1998Hi01,2011Ch23

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh and Jun Chen	NDS 172, 1 (2021)	31-Jan-2021

1980La01: (α,α') E=8.5-9.5 MeV and (^{16}O,^{16}O$'$) E=36.0-37.2 MeV for particle spectroscopy measurements; (^{16}O,^{16}O$'\gamma$) E=44.8 MeV for the gamma spectroscopy measurement. Alpha and ^{16}O beams were produced from the University of Montreal tandem Van de Graaff accelerator. Targets were 97.24% enriched ^{100}Ru. γ rays were detected with a Ge(Li) detector in the gamma spectroscopy measurement; scattered particles were detected with four surface-barrier detectors. Measured yields. Deduced matrix elements, quadrupole moments, B(E2), lifetimes. Comparisons with available data.

1998Hi01 (also 1980HiZV): (α,α') E=7.987-8.732 MeV; (^{16}O,^{16}O$'$) E=34.95-36.93 MeV. Alpha and ^{16}O beams were produced from the "tandem" electrostatic accelerator at the University of Sao Paulo. Targets were thin layers of metallic ^{100}Ru (97.2% enriched). Measured particle spectra. Deduced B(E2) and Q for first 2^+ state.

2011Ch23: E(^{100}Ru)=240 MeV produced by the Australian National University (ANU) 14UD Pelletron accelerator. Measured g factor.

2011Ta06: E(^{100}Ru)=227 and 280 MeV. Targets=^{12}C and ^{26}Mg layered with Gd and Cu. Measured g factor using transient-field perturbed angular correlation technique in Coulomb excitation in inverse kinematics. External magnetic field of 0.073 T was applied to the Gd layer in which the spins of the excited Ru nuclei precessed due to the interacting magnetic moment and the transient hyperfine field. The (particle)γ correlations were measured using Si detectors for particles. Measured spin precession angles. Deduced transient field strength.

Others: 1996Go36, 1978Fa08, 1977Ma41, 1974Hu01, 1969He11, 1968Mc08, 1965Ro09, 1961St02, 1958St32, 1956Te26.

Reactions:

(^{32}S,^{32}S$'\gamma$) E=48 MeV: 1977Ma41.

(^{16}O,^{16}O$'\gamma$) E=33-45 MeV: 1998Hi01, 1980La01, 1978Fa08, 1977Ma41, 1969He11, 1968Mc08.

(α,$\alpha'\gamma$) E=7.9-9.5 MeV: 1998Hi01, 1980La01, 1977Ma41, 1968Mc08, 1965Ro09, 1961St02, 1956Te26.

(α,α') E=9-17, 22 MeV: 1996Go36. Measured $\sigma(\theta)$ and excitation functions. First two 0^+, 2^+, 4^+ states and first 3^- state observed in (α,α') spectrum. See also (α,α') dataset.

(d,d$'$): 1996Go36 mentioned that experiments were in progress. No publication from this group has appeared as of July 2007.

(p,p$'\gamma$) E=2-3 MeV: 1958St32.

Q measurement: 1998Hi01, 1980La01, 1978Fa08, 1977Ma41.

g factor measurement by IMPAC method: 1974Hu01, 1969He11.

^{100}Ru Levels

E(level)	J$^\pi$[†]	T$_{1/2}$[‡]	Comments
0.0	0^+		
539.6 *1*	2^+	12.56 ps *13*	B(E2)↑=0.4938 *40* g=+0.429 *23* (2011Ch23); g=+0.44 *3* (2011Ta06); g=0.47 *15* (1974Hu01) Q=−0.54 *7* (1998Hi01) B(E2)↑: weighted average of 0.4930 *40* (1998Hi01,1980HiZV), 0.494 *6* and 0.482 *26* (1980La01), 0.520 *44* (1968Mc08) and 0.572 *40* (1958St32). B(E2)=0.30 *6* (1956Te26) seems discrepant. 2016Pr01 evaluation gives B(E2)=0.4927 *41*. These values correspond to the positive sign of the second 2^+ interference term. For negative sign of the interference term, B(E2)=0.493 *3* (1998Hi01), 0.492 *6* (1980La01). B(E2)=0.471 *14*, deduced from δ(charge) in (α,α') inelastic data (1996Go36). β_2R(charge)=1.154 *17* (1996Go36 from (α,α')). β_2=0.209 *2* (1980La01,1980HiZV). Q: −0.54 *7*, −0.33 *7* (1998Hi01,1980HiZV), −0.43 *7*, −0.20 *7* (1980La01); −0.40 *12* (1978Fa08); −0.13 *7* (1977Ma41). When two values are listed, the first value is for constructive (positive sign) interference (from the second 2^+ state) and the second value for the destructive (negative sign) interference. Method: reorientation effect in Coulomb excitation. See also 2016St14 evaluation, where Q=−0.44 *4* or −0.27 *7* are recommended from 1998Hi01 measurement.
1130.4 *6*	0^+	8.2 ps *12*	B(E2)↑=0.0191 *29* B(E2)(from 540 level) from 1980La01. Other: <0.023 (1968Mc08). β_{20}=0.150 (1980La01).
1226.5 *6*	4^+	2.6 ps *2*	B(E2)↑=0.260 *22*

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Coulomb excitation 1980La01,1998Hi01,2011Ch23 (continued)

^{100}Ru Levels (continued)

E(level)	J^{π}[†]	$T_{1/2}$[‡]	Comments
			B(E2)(from 540 level) from 1980La01. Other: 0.26 *3* (1968Mc08).
			β_{24}=0.184 (1980La01).
1362.1 *2*	2^+	1.25 ps *15*	B(E2)(from 540 level)=0.089 *13*, weighted average of 0.088 *13* (1980La01), 0.091 *16* (1968Mc08), and 0.09 *3* (1961St02).
			B(E2)(from g.s.)=0.0190 *23*, weighted average of 0.0203 *23* (1980La01), 0.0185 *25* (1968Mc08), 0.015 *5* (1961St02).
			β_{22}=0.144 (1980La01), β_{02}=0.044 (1980La01).
2166.0 *6*	3^-	34 ps *+12−8*	B(E3)↑=0.053 *9*
			Adopted B(E3) is from B(E3)=0.043 *7* (1980La01, with only 1626γ from 2166 level) and Branching(1626γ)=0.81 (from the Adopted Gammas).
			$T_{1/2}$: from B(E3)=0.053 *9* and the Adopted γ-ray branching ratio.
			β_3=0.115 or 0.152 (1980La01). B(E3)=0.053 gives β_3=0.128.
2367	4^+		Level from 1996Go36.

[†] From the Adopted Levels.
[‡] From B(E2) values and the Adopted γ-ray branching ratios.

$\gamma(^{100}Ru)$

E_i(level)	J_i^{π}	E_{γ}[†]	I_{γ}[†]	E_f	J_f^{π}	Comments
539.6	2^+	539.6 *1*	100	0.0	0^+	
1130.4	0^+	590.8 *5*	100	539.6	2^+	
1226.5	4^+	686.9 *5*	100	539.6	2^+	
1362.1	2^+	822.5 *2*	100	539.6	2^+	
		1362.1 *2*	52 *5*	0.0	0^+	I_{γ}: 73.0 *7* in the Adopted Gammas.
2166.0	3^-	1626.4 *5*	100	539.6	2^+	

[†] From 1980La01.

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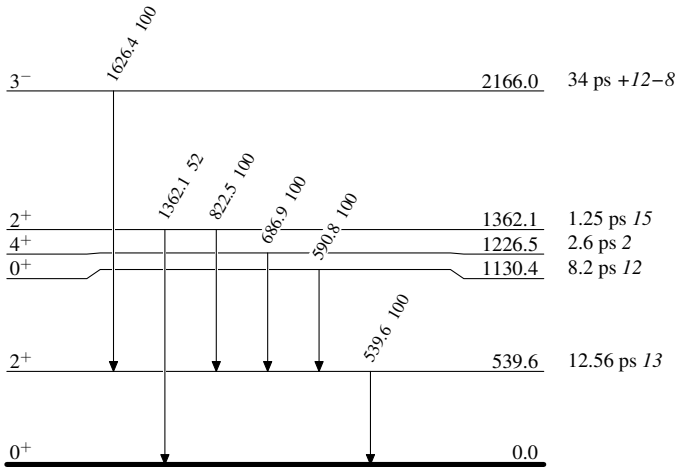
Level Scheme

Intensities: Relative photon branching from each level



$^{100}_{44}Ru_{56}$