

$^{16}\text{O}(\text{n},\gamma),(\text{n},\text{n})$ 1973Fo11

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	C. G. Sheu, J. H. Kelley, J. Purcell	ENSDF	5-Aug-2021

1971A109: $^{16}\text{O}(\text{n},\gamma)$, $E=420$ keV; measured $\sigma(E; E\gamma)$. ^{17}O resonances deduced level-width.

1973Fo11: $^{16}\text{O}(\text{n},\gamma),(\text{n},\text{n})$ $E=0.6-4.3$ MeV; measured $\sigma(E)$. ^{17}O deduced levels, J, π , Γ .

1988Ki02: $^{16}\text{O}(\text{n},\gamma)$, $E\approx$ resonance; measured $E\gamma$, $I\gamma$. ^{17}O , deduced resonance $\Gamma\gamma$. Valence capture model.

1992Igo1: $^{16}\text{O}(\text{n},\gamma)$, $E=280,434$ keV; measured $\sigma(E,E\gamma)$ at $\theta=125^\circ$. ^{17}O deduced resonance, $\Gamma\gamma$. Natural target. Valence-capture model.

1994Hu21: $^{16}\text{O}(\text{n},\gamma)$, $E=7-14$ MeV; measured $\sigma(\theta)$ vs E ; deduced $\sigma(\gamma,n_0)$. ^{17}O deduced pygmy resonance characteristics.

1996Na27: $^{16}\text{O}(\text{n},\gamma)$, $E=10-300$ keV; measured $E\gamma$, $I\gamma$, capture σ at some neutron energies. Implications for primordial and stellar nucleosynthesis.

2000OhZY: $^{16}\text{O}(\text{n},\gamma)$, $E\approx 150-550$ keV; measured σ .

2020Na34: $^{16}\text{O}(\text{n},\gamma)$, $E_{\text{ave.}}\approx 157-556$ keV; measured σ , deduced astrophysical reaction rates.

Theory:

2007AsZY: $^{16}\text{O}(\text{n},\gamma)$, $E=\text{low}$; calculated capture cross sections.

2010YaZW: $^{16}\text{O}(\text{n},\gamma)$, $E=\text{low}$; calculated intrinsic nuclear densities for two configurations.

1997Li10: $^{16}\text{O}(\text{n},\gamma)$, $E<600$ keV; calculated $\sigma(E_n)$; deduced influence of scattering potential depth. Consistent direct-semidirect model.

2001Du12: $^{16}\text{O}(\text{n},\gamma)$, $E(\text{cm})\approx 10-300$ keV; calculated σ . Generator coordinate method, cluster model. Comparisons with data.

2005Du20: $^{16}\text{O}(\text{n},\gamma)$, $E(\text{cm})\approx 10-300$ keV; calculated $\sigma(E)$. Microscopic two-cluster model, generator coordinate method, comparison with data. ^{17}O ; calculated levels, J, π .

2007AsZZ: $^{16}\text{O}(\text{n},\gamma)$, deduced S-factors using ANC values from transfer reactions.

2008Ch05: $^{16}\text{O}(\text{n},\gamma)$, $E=0.01-10$ MeV; calculated neutron capture cross sections.

2008YaZY: $^{16}\text{O}(\text{n},\gamma)$, $E<0.6$ MeV; calculated cross sections using the Cluster Orbital Shell Model to describe the nuclear structure.

2009Wa17: $^{16}\text{O}(\text{n},\gamma)$, $E(\text{cm})<1$ MeV; analyzed σ , spectroscopic factors and other parameters for nonresonant neutron capture using simple polynomials obtained from Taylor expansions. Comparison with experimental data.

2009Ya03: $^{16}\text{O}(\text{n},\gamma)$, $E(\text{cm})<10$ MeV; calculated cross sections.

2010Hu11: $^{16}\text{O}(\text{n},\gamma)$, $E(\text{cm})<2$ MeV; calculated binding energies, σ , S-factors, spectroscopic factors. Single-particle potential model.

2010Pr07: $^{16}\text{O}(\text{n},\gamma)$, $E=0.001-1$ MeV; calculated Maxwellian-averaged σ and astrophysical reaction rates using evaluated neutron libraries; deduced ENDF/B-VII.0, JENDL-3.3, JEFF-3.1, ENDF/B-VI.8 neutron-induced reaction σ deficiencies. Comparison with experimental data and KADONIS.

2010Sp01: $^{16}\text{O}(\text{n},\gamma)$, E not given; calculated asymptotic normalization constants (ANC) as a function of binding energy for subthreshold bound states using the analytic continuation of the scattering (S) matrix in the complex wave-number plane.

2011Ch57: $^{16}\text{O}(\text{n},\gamma)$, $E=30$ keV; calculated Maxwellian-averaged σ using ENDF/B-VII.1 evaluated neutron library. Comparison with ENDF/B-VII.0 and KADONIS values.

2012Pr13: $^{16}\text{O}(\text{n},\gamma)$, $E<20$ MeV; calculated Maxwellian-averaged σ , astrophysical reaction rates, neutron thermal σ , Westcott factors, resonance integrals and their uncertainties using evaluated neutron libraries; deduced ENDF/B-VII.1, JEFF-3.1.2, JENDL-4.0, ROSFOND 2010, CENDL-3.1, EAF 2010 neutron-induced reaction σ deficiencies. Comparison with experimental data, KADONIS and Atlas of Neutron Resonances.

2012Xu09: $^{16}\text{O}(\text{n},\gamma)$, $E=1-10000$ keV; calculated total neutron direct capture cross sections. Comparison with experimental data.

2013Du15: $^{16}\text{O}(\text{n},\gamma)$, $E<1$ MeV; calculated σ . Modified cluster model with the classification of orbital states according to Young tableaux, comparison with available data.

2013Du16: $^{16}\text{O}(\text{n},\gamma)$, $E<1$ MeV; calculated σ , phase shifts. Young diagrams, potential cluster model.

2013He11: $^{16}\text{O}(\text{n},\text{n}),(\text{n},\gamma)$, $E<20$ MeV; calculated JENDL-4.0 covariances. Comparison with available data.

2014Xu09: $^{16}\text{O}(\text{n},\gamma)$, $E=0.001-10$ MeV; calculated total capture $\sigma(E)$ for three processes of compound-nucleus capture (CNC), pre-equilibrium capture (PEC), and direct capture (DIC) using Hauser-Feshbach model, the exciton model, and potential model, respectively, and Compared with experimental data. $Z=8-100$, $N=10-180$; calculated total neutron-capture cross sections and astrophysical reaction rates using TALYS code for about 8000 nuclei. Impact of the newly determined reaction rates on the r process abundances.

2015Sa01: $^{16}\text{O}(\text{n},\text{n}),(\text{n},\text{n}'),(\text{n},\gamma)$, $E<20$ MeV; analyzed available data; deduce σ uncertainties adjustments. Comparison with available data.

2015Zh13: $^{16}\text{O}(\text{n},\gamma)$, $E<3$ MeV; calculated $\sigma(E)$ using nuclear structure information obtained from a covariant density functional

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theory as input for the FRESKO coupled reaction channels code; investigated impact of pairing, spectroscopic factors, and optical potentials on direct capture cross sections. Comparison with experimental data.

2016Mo23: $^{16}\text{O}(n,\gamma)$, $E < 700$ KeV; analyzed available experimental data from KADoNIS and REACLIB, ENDF/B-VII.1, JEFF-3.2, JENDL-4.0 evaluated libraries; deduced Maxwellian-averaged σ , reaction rates.

2018Br05: $^{16}\text{O}(n,\gamma)$, $E = 30$ keV; calculated Maxwellian-averaged σ using ENDF/B-VIII.0 evaluated neutron library. Comparison with ENDF/B-VII.1 and KADONIS values.

2020He19: $^{16}\text{O}(n,\gamma)$, $E < 1$ MeV; analyzed contributions from single-particle resonances, evaluated astrophysical reaction rates and associated uncertainties for nucleosynthesis.

2021Zh26: $^{16}\text{O}(n,\gamma)$, calculated direct capture, thermonuclear reaction rates for astrophysical applications.

See also (2001Sh27).

 ^{17}O Levels

Γ : From (1973Fo11) except where noted.

E(level) ^{†‡}	J^π [†]	Γ [#]	Comments
0	$5/2^+$		E(level), J^π : from ENSDF database.
870	$1/2^+$		E(level), J^π : from ENSDF database.
4544 10	$3/2^-$		E(level): from $E_{\text{res}} = 426$ keV 10 (1971Al09). $\Gamma_n = 60$ keV 15, $\Gamma_\gamma < 4.0$ eV (1971Al09).
5216		< 0.1 keV	E(level): not observed in σ_t (1973Fo11).
5697 2	$7/2^-$	3.4 keV	
5733 2	^a	< 1 keV	
5868 2	$3/2^+$	6.6 keV	
5939 4	$1/2^-$	32 keV	
6356 8	$1/2^+$	124 keV	
6862 2	^a	< 1 keV	
6972 2	^a	< 1 keV	
7165 3	$5/2^-$ @	1.3 keV	
7202 10	$3/2^+$	280 keV	
7379 3	$5/2^+$ @	0.5 keV	
7382 3	$5/2^-$ @	1.1 keV	
7559 20	$3/2^-$	500 keV	
7575		< 0.1 keV	E(level): not observed in σ_t (1973Fo11).
7687 4	$7/2^-$	18 keV	
7958 8	$1/2^+$	90 keV	
7992 50	$1/2^-$	270 keV	
8060 8	$3/2^+$	85 keV	
8181 20	$1/2^-$ &	69 keV	
8199 10	$3/2^-$ &	52 keV	Γ : deduced from (1961Fo07).

[†] From (1973Fo11) except where noted.

[‡] Calculated from $E(\text{level}) = 4143 + (16/17) \times E_{\text{res}}$.

[#] Uncertainties in widths $\approx 0.1\Gamma$ for $\Gamma > 3$ keV and $\approx 0.3\Gamma$ for $\Gamma < 3$ keV. The (1973Fo11) values have overlap with those given in $^{16}\text{O}(n,n),(n,n')$; the uncertainties are given there to avoid duplication.

@ Assignment based on $^{13}\text{C}(\alpha,n)$ and $^{16}\text{O}(n,n)$ (1970Fo03,1957Wa46), and $^{13}\text{C}(\alpha,n)$ (1973Ba10).

& Assignment based on $^{13}\text{C}(\alpha,n)$ (1957Wa46).

^a J^π : not $1/2^+$ (1973Fo11).

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E_γ	$E_i(\text{level})$	J_i^π	E_f	J_f^π	Comments
3674	4544	$3/2^-$	870	$1/2^+$	$\Gamma_\gamma=1.64$ eV 31 (1988Ki02); $\Gamma_\gamma=1.85$ eV 35 (1992Ig01)
4544	4544	$3/2^-$	0	$5/2^+$	$\Gamma_\gamma=1.59$ eV 31 (1988Ki02); $\Gamma_\gamma=1.80$ eV 35 (1992Ig01)

 $^{16}\text{O}(\text{n},\gamma),(\text{n},\text{n})$ 1973Fo11Level Scheme