

IONIC RADII IN CRYSTALS

Ionic radii are a useful tool for predicting and visualizing crystal structures. This table lists a set of ionic radii R_i in Å units for the most common coordination numbers CN of positive and negative ions. The values are based on experimental crystal structure determinations, supplemented by empirical relationships, and theoretical calculations. The notation sq after the coordination number indicates a square configuration, while py indicates pyramidal.

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References

1. Shannon, R. D., *Acta Crystallogr.* A32, 751, 1976.
2. Jia, Y. Q., *J. Solid State Chem.* 95, 184, 1991.

Ion	CN	$R_i/\text{Å}$	Ion	CN	$R_i/\text{Å}$	Ion	CN	$R_i/\text{Å}$
Anions								
F ⁻¹	6	1.33		8	1.12	Eu ⁺³	6	0.95
Cl ⁻¹	6	1.81		10	1.23		8	1.07
Br ⁻¹	6	1.96		12	1.34	F ⁺⁷	6	0.08
I ⁻¹	6	2.20	Cd ⁺²	4	0.78	Fe ⁺²	4	0.63
OH ⁻¹	4	1.35		6	0.95		6	0.61
	6	1.37		8	1.10		8	0.92
O ⁻²	2	1.21		12	1.31	Fe ⁺³	4	0.49
	6	1.40	Ce ⁺³	6	1.01		6	0.55
	8	1.42		8	1.14		8	0.78
S ⁻²	6	1.84		10	1.25	Fr ⁺¹	6	1.80
Se ⁻²	6	1.98	Ce ⁺⁴	6	0.87	Ga ⁺³	4	0.47
Te ⁻²	6	2.21		8	0.97		6	0.62
Cations				10	1.07	Gd ⁺³	6	0.94
Ac ⁺³	6	1.12		12	1.14		8	1.05
Ag ⁺¹	4	1.00	Cf ⁺³	6	0.95	Ge ⁺²	6	0.73
	6	1.15	Cf ⁺⁴	6	0.82	Ge ⁺⁴	4	0.39
	8	1.28		8	0.92		6	0.53
Ag ⁺²	4sq	0.79	Cl ⁺⁵	3py	0.12	Hf ⁺⁴	4	0.58
	6	0.94		8	0.92		6	0.71
Al ⁺³	4	0.39	Cl ⁺⁷	4	0.08		8	0.83
	5	0.48	Cm ⁺³	6	0.97	Hg ⁺¹	6	1.19
	6	0.54	Cm ⁺⁴	6	0.85	Hg ⁺²	2	0.69
Am ⁺³	6	0.98		8	0.95		4	0.96
	8	1.09	Co ⁺²	4	0.56		6	1.02
Am ⁺⁴	6	0.85		6	0.65		8	1.14
	8	0.95		8	0.90	I ⁺⁵	3py	0.44
As ⁺³	6	0.58	Co ⁺³	6	0.55		6	0.95
As ⁺⁵	4	0.34	Cr ⁺²	6	0.73	I ⁺⁷	4	0.42
	6	0.46	Cr ⁺³	6	0.62		6	0.53
Au ⁺¹	6	1.37	Cr ⁺⁴	4	0.41	In ⁺³	4	0.62
Au ⁺³	4sq	0.64		6	0.55		6	0.80
	6	0.85	Cr ⁺⁶	4	0.26	Ir ⁺³	6	0.68
Ba ⁺²	6	1.35		6	0.44	Ir ⁺⁴	6	0.63
	8	1.42	Cs ⁺¹	6	1.67	Ir ⁺⁵	6	0.57
	12	1.61		8	1.74	K ⁺¹	4	1.37
Be ⁺²	4	0.27		10	1.81		6	1.38
	6	0.45		12	1.88		8	1.51
Bi ⁺³	5	0.96	Cu ⁺¹	2	0.46		12	1.64
	6	1.03		4	0.60	La ⁺³	6	1.03
	8	1.17		6	0.77		8	1.16
Bi ⁺⁵	6	0.76	Cu ⁺²	4sq	0.57		10	1.27
Bk ⁺³	6	0.96		6	0.73		12	1.36
Bk ⁺⁴	6	0.83	Dy ⁺²	6	1.07	Li ⁺¹	4	0.59
	8	0.93		8	1.19		6	0.76
Br ⁺⁵	3py	0.31	Dy ⁺³	6	0.91		8	0.92
Br ⁺⁷	4	0.25		8	1.03	Lu ⁺³	6	0.86
	6	0.39	Er ⁺³	6	0.89		8	0.97
C ⁺⁴	4	0.15		8	1.00	Mg ⁺²	4	0.57
	6	0.16	Eu ⁺²	6	1.17		6	0.72
Ca ⁺²	6	1.00		8	1.25		8	0.89
				10	1.35	Mn ⁺²	4	0.66

Ion	CN	$R_i/\text{\AA}$	Ion	CN	$R_i/\text{\AA}$	Ion	CN	$R_i/\text{\AA}$
	6	0.83	Pr ⁺³	6	0.99	Tc ⁺⁴	6	0.65
	8	0.96		8	1.13	Te ⁺⁴	4	0.66
Mn ⁺³	6	0.58	Pr ⁺⁴	6	0.85		6	0.97
Mn ⁺⁴	4	0.39		8	0.96	Te ⁺⁶	4	0.43
	6	0.53	Pt ⁺²	4sq	0.60		6	0.56
Mn ⁺⁵	4	0.33		6	0.80	Th ⁺⁴	6	0.94
Mn ⁺⁶	4	0.26	Pt ⁺⁴	6	0.63		8	1.05
Mn ⁺⁷	4	0.25	Pu ⁺³	6	1.00		10	1.13
Mo ⁺³	6	0.69	Pu ⁺⁴	6	0.86		12	1.21
Mo ⁺⁴	6	0.65	Pu ⁺⁵	6	0.74	Ti ⁺²	6	0.86
Mo ⁺⁵	4	0.46	Pu ⁺⁶	6	0.71	Ti ⁺³	6	0.67
	6	0.61	Ra ⁺²	8	1.48	Ti ⁺⁴	4	0.42
Mo ⁺⁶	4	0.41		12	1.70		6	0.61
	6	0.59	Rb ⁺¹	6	1.52		8	0.74
	7	0.73		8	1.61	Tl ⁺¹	6	1.50
N ⁺³	6	0.16		10	1.66		8	1.59
N ⁺⁵	6	0.13		12	1.72		12	1.70
Na ⁺¹	4	0.99	Re ⁺⁴	6	0.63	Tl ⁺³	4	0.75
	6	1.02	Re ⁺⁵	6	0.58		6	0.89
	8	1.18	Re ⁺⁶	6	0.55		8	0.98
	9	1.24	Re ⁺⁷	4	0.38	Tm ⁺²	6	1.01
	12	1.39		6	0.53		7	1.09
Nb ⁺³	6	0.72	Rh ⁺³	6	0.67	Tm ⁺³	6	0.88
	8	0.79	Rh ⁺⁴	6	0.60		8	0.99
Nb ⁺⁴	6	0.68	Rh ⁺⁵	6	0.55	U ⁺³	6	1.03
Nb ⁺⁵	4	0.48	Ru ⁺³	6	0.68	U ⁺⁴	6	0.89
	6	0.64	Ru ⁺⁴	6	0.62		8	1.00
	8	0.74	Ru ⁺⁵	6	0.57		12	1.17
Nd ⁺³	6	0.98	Ru ⁺⁷	4	0.38	U ⁺⁵	6	0.76
	8	1.12	Ru ⁺⁸	4	0.36	U ⁺⁶	2	0.45
	9	1.16	S ⁺⁴	6	0.37		4	0.52
	12	1.27	S ⁺⁶	4	0.12		6	0.73
Ni ⁺²	4sq	0.49		6	0.29		8	0.86
	6	0.69	Sb ⁺³	4py	0.76	V ⁺²	6	0.79
Ni ⁺³	6	0.56		6	0.76	V ⁺³	6	0.64
Np ⁺³	6	1.01	Sb ⁺⁵	6	0.60	V ⁺⁴	5	0.53
Np ⁺⁴	6	0.87	Sc ⁺³	6	0.75		6	0.58
Np ⁺⁵	6	0.75		8	0.87		8	0.72
Np ⁺⁶	6	0.72	Se ⁺⁴	6	0.50	V ⁺⁵	4	0.36
Os ⁺⁴	6	0.63	Se ⁺⁶	4	0.28		5	0.46
Os ⁺⁵	6	0.58		6	0.42		6	0.54
Os ⁺⁶	6	0.55	Si ⁺⁴	4	0.26	W ⁺⁴	6	0.66
Os ⁺⁸	4	0.39		6	0.40	W ⁺⁵	6	0.62
P ⁺⁵	4	0.17	Sm ⁺²	6	1.19	W ⁺⁶	4	0.42
	6	0.38		8	1.27		5	0.51
Pa ⁺³	6	1.04	Sm ⁺³	6	0.96		6	0.60
Pa ⁺⁴	6	0.90		8	1.08	Y ⁺³	6	0.90
Pa ⁺⁵	6	0.78		12	1.24		8	1.02
Pb ⁺²	6	1.19	Sn ⁺⁴	4	0.55		9	1.08
	8	1.29		6	0.69	Yb ⁺²	6	1.02
	10	1.40		8	0.81		8	1.14
	12	1.49	Sr ⁺²	6	1.18	Yb ⁺³	8	0.99
Pb ⁺⁴	4	0.65		8	1.26		9	1.04
	6	0.78		10	1.36	Zn ⁺²	4	0.60
	8	0.94		12	1.44		6	0.74
Pd ⁺²	4sq	0.64	Ta ⁺³	6	0.72		8	0.90
	6	0.86	Ta ⁺⁴	6	0.68	Zr ⁺⁴	4	0.59
Pd ⁺³	6	0.76	Ta ⁺⁵	6	0.64		6	0.72
Pd ⁺⁴	6	0.62	Tb ⁺³	6	0.92		8	0.84
Pm ⁺³	6	0.97		8	1.04		9	0.89
	8	1.09	Tb ⁺⁴	6	0.76			
Po ⁺⁴	6	0.97		8	0.88			