

Table 1. Lattice parameters (in pm) of AnX compounds with the NaCl (B1)-type structure (cubic, Fm3m no. 225, $Z = 4$, equivalent positions: An, 4a; X, 4b). – See also Table 2.

Element	Carbides	Pnictides (group VA)				
	C	N	P	As	Sb	Bi
Th	534.26(3) [1]	516.66(4) [2]	583.25(6) [3]	597.8(1) [4]	631.8(1) [4]	390.9 [5]
Pa	506.74 [6]	504.7(1) [6]		575.60 [7]		
U	496.06(5) [8]	488.87(3) [8]	558.44(5) [8]	577.67(5) [8]	620.4(3) [9]	636.27 [10]
Np	499.97(3) [11]	489.77(1) [12]	561.48 [13]	583.66(5) [14]	624.85(7) [12]	637.32 [15]
Pu	497.43 [12]	490.46(4) [16]	566.3 [17]	585.65(5) [14]	623.96(1) [12]	635.88(9) [15]
²⁴¹ Am		499.5(2) [18]	571.14(3) [18]	587.3(2) [19]	624.0(2) [18]	633.5(2) [19]
²⁴⁸ Cm		502.7 [20]	574.3 [21]	588.7 [20]	624.3 [20]	633.2(8) [10]
²⁴⁹ Bk		495.1(1) [22]	566.9(1) [22]	582.6(2) [22]	619.5 [22]	
²⁴⁹ Cf		495 [23]		580.9 [21]	616.5 [21]	632.5 [5]

Stoichiometric (or closest to stoichiometric) composition samples.

References [...]: 1: 68LRKW, 2: 85GSBI, 3: 67JB, 4: 88GSBD, 5: 82BBF, 6: 78BM, 7: 79CSR, 8: 86SGBI, 86SBDG, 9: 89SGBD, 10: 93GHBH, 11: 71LMPL, 12: 71ML, 72L, 13: 74LM, 14: 89DBSP, 15: 89GSBD, 16: 78HLMM, 17: 66MK, 18: 70ML, 76CBDD, 75CBDM, 19: 74R, 20: 80DHP1, 21: 79DHP2, 22: 80DHP2, 87GH, 23: 86NMHP.

Table 2. Magnetic properties of actinide mononpnictides [92MV, 95VM, 95LB].

	a [nm]	Magnetism	$T_{C/N}$ [K] T_i [K]	Θ_p [K]	p_{eff} [μ_B]	p_0 [μ_B] (ND)	p_s [μ_B] (M)	Easy axis	Ref.
UN	0.4890	AFI - $1k$	53		3.1	0.75		[100]	1, 2
UP	0.5588	AFI - $1k$	125	13.5	3.2	1.7	0.53	[100]	1, 2
		AFI - $2k$	23			1.9	1.89(5)	[110]	1, 2
UAs	0.5768	AFI - $1k$	127	50	3.4	1.9	0.53	[100]	1, 2
		AFIA - $2k$	66			2.25	2.13	[110]	1, 2
USb	0.6209	AFI - $3k$	214	169	3.8	2.85		[111]	1, 2
UBi	0.6364	AFI - ?	285	115	4.0	3.0			3, 4
NpN	0.4897	F	87	100	2.4	1.4	0.9	[111]	5
NpP	0.5615	AFI - $3k$, IC	119	110	2.85	2.2 (1.9)	1.8	[100]	6
		AF(3^+ , 3^-) - $1k$	74				2.3	[100]	6

Table 2 (cont.)

	a [nm]	Magnetism	$T_{C/N}$ [K] T_t [K]	\mathcal{O}_p [K]	p_{eff} [μ_B]	p_0 [μ_B] (ND)	p_s [μ_B] (M)	Easy axis	Ref.
NpAs	0.5835	AFI - $1\mathbf{k}$, IC	175	184	2.82	2.5	1.74	[100]	7
		AF($4^+, 4^-$) - $1\mathbf{k}$	154					[111]	7
		AFI - $3\mathbf{k}$	138						
NpSb	0.6254	AFI - $3\mathbf{k}$	197	161	2.5	2.5		[111]	8
NpBi	0.6438	AFI - $3\mathbf{k}$	193			2.48		[111]	9
PuN	0.4905	AF	(13)	−200	1.1		0.25		10
PuP	0.5550	F	130	125	0.97	0.75	0.6	[100]	11
PuAs	0.5858	F	129	125	1.0	0.75	0.67	[100]	12
PuSb	0.6241	AFI - $1\mathbf{k}$, IC	85	85	1.0	0.75	0.6	[100]	12, 13
		F	75		0.74	0.65	[100]	14	
PuBi	0.6358	AFI - $1\mathbf{k}$	65		0.8	0.50	0.61	[100]	12
^{241}AmN	0.4995	TIP	$\chi_p = 780 \cdot 10^{-6}$ emu/mol						15
AmP	0.5711	TIP							Ref.
$^{241}\text{AmAs}$	0.5876	TIP (AF)	(13)	$\chi_p = 535 \cdot 10^{-6}$ emu/mol					15
$^{241}\text{AmSb}$	0.6240	TIP	$\chi_p = 1250 \cdot 10^{-6}$ emu/mol						16
AmBi	0.6338	TIP	$\chi_p = 500 \cdot 10^{-6}$ emu/mol						17
^{244}CmN	0.5041	F	109	109	7.02		1.7		15
^{248}CmN			193	129	6.93				10
^{248}CmP	0.5743	F	73	—	—				15
$^{244}\text{CmAs}$	0.5905	F	88	88	6.58				15
$^{248}\text{CmSb}$	0.6243	F	162						16
^{249}BkN	0.4951	F	88	68	7.9 (7.85)				18
^{249}CfN	0.495	F	25(5)	−41	10.3(2)				19, 20
^{249}CfP									
$^{249}\text{CfAs}$	0.5809	AF	17.5(3)	−29	10.1(2)				19, 20
$^{249}\text{CfSb}$	0.6166	AF	25(5)	−18	10.3(2)				19, 20

References: 1: 84RLB, 2: 92MV, 3: 66TZ, 4: 69KLC, 5: 74ADHL, 6: 73LDAN, 94BABJ, 7: 92MVRS, 8: 88SBQB, 9: 92BBRS, 10: 81NHPD, 11: 76LL, 12: 86MVS2, 13: 89V, 14: 87SSRV, 15: 76KCMM, 16: 71DLKS, 17: 92MV, 18: 81NHH, 19: 86NMHP, 20: 87HN.

Table 3. Thermal properties of uranium monopnictides [85ROV2].

UX	d_{U-U} [Å]	γ [mJ/mol K ²]	Θ_D [K]	Temperature range [K]	Ref.
UC	3.51	20.3	254	1.5 < T < 4.2	1
		18.7		1 < T < 9	2
			269 (ultra velocity)	RT	3
UN	3.46	25.8(5)	249(3)	0.1 < T < 12	4
		49.6	324(7)	1.3 < T < 4.6	5
		49.6	234	1.5 < T < 10	6
		46	289	5 < T < 23	7
			291 (ultra velocity)	RT	3
			361 (ultra velocity)	RT	8
UP	3.95	32.1(1)	319(4)	0.12 < T < 11	4
UAs	4.08	53.2(2)	221(2)	0.12 < T < 11	4
		53		T > 5	9
USb ^{a)}	4.38	4.36(25)	168(3)	0.12 < T < 11	4
USb ^{b)}		4.56(25)	169(3)	0.12 < T < 11	4

^{a)} and ^{b)} – two single crystalline samples.

References: 1: 63DCM, 2: 64HMM, 3: 70PGD, 4: 85ROV2, 5: 68SDFB, 6: 72DC, 7: 66WB, 8: 69WFP, 9: 80BTLM.

Table 4. Experimental results and fit parameters of transport measurements for the uranium monopnictides [84SFV]. - The two equations for the fitting of the magnetic part of the resistivity, ρ_m , of USb were used: $\rho_m(T) = c_m T^2 e^{-\Delta/k_B T}$ or $c_m T^4$, i.e with an energetic gap Δ or without gap, respectively.

	N [10 ²² cm ⁻³]	$T_{C/N}, T_t$ [K]	ρ_0 [μΩ cm]	c_{ph} [μΩ cm/K]	ρ_m [μΩ cm]	c_m [μΩ cm/K ²]	Δ/k_B [K]	E_F [eV]	$Z^{**})$ [e/F.U.]
UP	2.29	119, 23	56		≈ 200			0.75	0.65
UAs	2.08	123, 63	≈ 7		≈ 270	3.5 μΩ cm/K		0.61	0.48
USb	1.68	215	90	(0.14) [*])	≈ 1040	0.22 5.1 · 10 ⁻⁵ μΩ cm/K ⁴	50 0	0.20	0.09

^{*}) Estimated from the low-temperature fits of the resistivity.

^{**)} Number of conduction electrons per formula unit

Table 5. Pressure-induced structural transitions in actinide monocarbides, and mononictides. From top to bottom for each compound: the structure of the high-pressure phase, the pressure range of the upstroke transition (in GPa), and the volume decrease at the transition. (+ means compound exists but not studied) [95B].

X	An				
	Th	U	Np	Pu	
C	(B1 up to 65 GPa)	orthorhombic ≈ 27 GPa ≈ 6%	+	+	
N	(B1 up to 47 GPa)	rhombohedral ≈ 29 GPa ≈ 3%	+	+	
P	B2 ≈ 30 GPa ≈ 12 %	rhombohedral ≈ 10.0 GPa	orthorhombic ≈ 28 GPa	+	+
As	B2 18...26 GPa ≈ 10%	B2 18...30 GPa ≈ 11%	B2 25...40 GPa ≈ 9%	B2 35...38 GPa ≈ 9%	
Sb	B2 9...12 GPa ≈ 9%	B2 9...10 GPa ≈ 12%	tetragonal 10...18 GPa 12%	B2 ≈ 20 GPa ≈ 4%,	tetragonal ≈ 40GPa ≈ 5%
Bi	B2 ≤ 0 GPa +	B2 ≈ 5 GPa ≈ 11%	tetragonal ≈ 8.5 GPa 12%	B2 dist. *) ≈ 10GPa ≈ 12%	

*) [99MHRR]

Table 6. Isothermal bulk moduli B_0 (in GPa) (top) and pressure derivatives B_0' (bottom) for actinide monocarbides and mononictides (+ means that given compound exists, but not studied) [95B].

X	An			
	Th	U	Np	Pu
C	109(4) 4.0(3)	160(4) 3.6(5)	+	+
N	175(15) 4.0(4)	203(6) 6.3(6)	+	+
P	137(7) 5(1)	102(4) 4(1)	+	+
As	118(4) 3.4(10)	100(4) 4.4(4)	70(1) 6.2(6)	69(3) 3.3(3)
Sb	84(8) 5(2)	62(3) 4(1)	55(2) 8(2)	68(2) 3.3(5)

Table 7. High-pressure data for mononitrides and monobismuthides of americium, curium and californium [95B].

		Am	Cm	Cf
N	B1 up to ~ 50 GPa			
	B_0	88(5) GPa	n.d	n.d
	B_0'	11(2)	n.d	n.d
	Reference	[1]	[2]	[2]
Bi	h.p. phase	tetragonal	B2	tetragonal
	p_{trans}	15 GPa	~ 12 GPa	~ 20 GPa
	ΔV_{trans}	~ 12%	~ 16%	0
	B_0	75(2) GPa	53(3) GPa	105(5) GPa
	B_0'	5(1)	8(2)	-2(2)
	Reference	[3]	[4]	[5]

References [...]: 1: 93BH, 2: Haire, R.G. (unpublished, 1987), 3: Haire, R.G, Heathman, Benedict, U. (unpublished), 4: 93GHBH, 5: 92G.

Table 8. Critical parameters β and ν in Ce, U, Np, and Pu mononitrides. R is the anisotropy ratio. β : critical exponent of spontaneous magnetization, ν : critical exponent concerning inverse correlation length. Numbers in parentheses refer to standard deviations of the least significant digit [93L2].

	Lattice parameter [nm]	T_N [K]	β	ν	R	Ref.
CeAs	0.6078	8			0.6(1)	1
CeSb	0.6412	16	First-order transition		1.8(2)	1
CeBi	0.6487	25.4	0.317(5)	0.63(6)	2.5(2)	2
UN	0.4890	54	0.31(3)	0.84(5)	2.8(3)	3
UAs	0.5779	124	First-order transition		3.8(5)	4
USb	0.6191	212.2	0.32(2)	0.68(4)	5.0(5)	5
NpAs	0.5838	173.6	0.38(1)	0.73(2)	2.9(5)	6
NpSb	0.6254	199.0	0.257(5)		4.5(10)	6
NpBi	0.6438	192.5	0.31(2)			7
PuSb	0.6225	85.3	0.31(2)	0.58(5)	1.8(3)	8
Classical mean field			0.5	0.5		
3D Heisenberg			0.345	-0.7		
3D Ising			0.3125	0.64		
2D Ising			0.125	1.0		

References: 82HFHV, 3: 82HBSL, 4: 80SLSV1, 2, 5: 78LSSV, 88HSL, 6: 91JSLR, 7: Boudarot and Burlet (unpublished), 8: 87BQRS.

Table 9. Crystal structure distortions in uranium, neptunium and plutonium monocarbide and mononpnictides crystallizing at RT in the NaCl-type structure. For a rhombohedral distortion, the change from the rhombohedral angle of 60° is given by $\Delta\alpha = -4/(27)^{1/2}(c-a)/a$ rad, where the distances c and a are measured parallel and perpendicular to the trigonal axis, respectively. In the cubic phase, $c/a = 1.00$ [80KLMV]. When $\Delta\alpha > 0$ the cube axis is compressed and for $\Delta\alpha < 0$ is stretched. R-rhombohedral, T-tetragonal.

Material	a_0 [nm] at RT	T_C [K]	T_N [K]	Magnetic structure	Type of distortion	$10^4(c-a)/a$ (± 3)	Ref.
UN	0.4890		53	AFI		< 2	1
UP	0.5589		125	AFI		≤ 5	2, 3
UAs	0.5779		127	AFI & IA		< 2	1
USb	0.6191		220	AFI		< 2	1
NpP	0.5615		130	AF(3+, 3-)	T	-42	3
NpAs	0.5838		(142)	AFI		≤ 3	3
NpAs	0.5838		175	AF(4+, 4-)	T	-8	3
NpSb	0.6254		207	AFI		≤ 15	3
NpC	0.5005		310	AFI		≤ 5	3
NpC	0.5005	220		F	R	+23	3
NpN	0.4897	87		F	R	-52	3
PuP	0.5667	125		F	T	-31	4

References. : 75MSWK, 3: 74LM, 4: 79MLHK.

Table 10. RT-elastic constants of UC and mononpnictides UX.

Compound	Ref.	c_{11} [10^{11} dyn/cm 2]	c_{44} [10^{11} dyn/cm 2]	c_{12} [10^{11} dyn/cm 2]
UC	1	31.49 ± 0.09	6.52 ± 0.02	7.88 ± 0.02
UC	2	34.4 ± 4.8	6.1 ± 1.1	10.5 ± 5.6
UN	3	42.0 ± 0.4	7.90 ± 0.08	9.00 ± 0.09
UN	4	39.1 ± 3.6	8.0 ± 1.0	9.0 ± 4.3
UAs	5	25.0 ± 1.0	2.6 ± 0.5	1.0 ± 1.5
USb	5, 6	16.0 ± 1.0	2.0 ± 1.0	0.7 ± 1.5

References: 72S, 3: 77VD1, 4: 78DHSB, 5: 83SLV, 6: 86NVVW.

Table 11. Force constants: radial (A) and tangential (B) force derived from fits of the rigid-ion model (*Z* is ionic charge) to the phonon-dispersion relations. Parameters for UP are interpolated [86JHBD].

Compound	Ref.	<i>a</i> [nm]	Force constants [Nm ^{−1}]						Ionic charge <i>Z</i>
			U–X		U–U		X–X (Y–Y)		
			A	B	A'	B'	A''	B''	
UC	1	0.4960	44.1	2.3	38.5	−0.5	−0.7	−0.7	0.0
UN	2	0.4895	51.9±3.1	6.3±2.0	35.4±2.4	−1.2±1.2	−1.6±0.8	−0.0±0.8	0.3±0.1
UP	3	0.5590	63.4	5.8	5.7	−0.4	1.3	0.1	
UAs	4	0.5779	59.3	2.9	2.3	4.0	4.9	0.6	0.0
USb	4	0.6205	51.3	1.8	2.7	2.1	2.2	1.9	0.0

References: 1: 72S, 2: 78DHSB, 3: 86JHBD, 4: 83SLV.

Table 12. Knight shift for the NaCl-type actinide compounds [70F1].

Compound	$dK/d\chi$ [emu/mol] ⁻¹	B_{hf} [T]	g_{J}	B_{eff} [10 ⁻¹ T]	$IN(E_{\text{F}})^*$ ·10 ³	f_{s} ·10 ³
UC ^{a)}	–	30	4/5	–47	–15.6	–5.0
UN ^{b)}	4.2	58	8/11	–62	–10.7	–5.3
UP ^{c)}	4.0	76	8/11	–58	–7.7	–3.8
PuC ^{d)}	4.0	30	3/5	–43	–14.2	–4.7
PuP ^{d)}	16.7	76	2/7	–37	–4.9	–4.1

*) IN in the RKKY model is the effective s-f exchange interaction integral

a) 68LRKW, b) 69K, c) 69KBM, d) 69LFK.

Table 13. Hyperfine parameters in Np containing compounds [85DK].

Compound	B_{hf} [T]	IS [mm/s] *)	eq [10 ¹⁸ V/cm ²]
NpC	495.0(60)	–18(2)	–
NpN	306.0(40)	–6(1)	0.22(5)
NpP	471.0(40)	7(1)	–0.68(5)
	413.0(40)	7(1)	–0.59(5)
NpAs	538.0(40)	16(1)	–1.71(5)
NpSb	534.0(40)	20(1)	–1.46(5)

*) Relative to NpAl₂.