No. 39A-4 $[N(CH_3)_4]_2MnCl_4$, Tetramethylammonium tetrachloromanganate

(M = 345.04; [D: 369.19])

1b	phase	VI	V	IV	III	II *)	I	81Mas
	state		P	P	P		P	
	crystal system		monoclinic [a])	monoclinic	monoclinic		ortho-rhombic	[a]) 84Ges
	space group		$P12_1/c1-C_{2h}^5$ [a])	$P112_1/n-C_{2h}^5$	$P2_1/c11-C_{2h}^5$		$Pmcn-D_{2h}^{16}$	[b]) 89Ges [c]) 89Mar
	Θ [K]	90 [b]) [c]) [D: 68 113 **])		172.2 [a]) 157	266.7 [a]) 267	291.7	292.3 296] [b])	

*) Incommensurate structural modulation was found along the c axis. See subsection 14a.

**) New anomaly was found in dielectric constants. 89Ges

$\rho = 1.327 \cdot 10^3$ kg m^{-3}. 94Kub

$\rho_X = 1.303 \cdot 10^3$ kg m^{-3}. 89Mas

Light yellow in color, deliquescent. 84Ges

2a Crystal growth: evaporation method from aqueous solution. 81Mas

3a Unit cell parameters: 89Mas
Phase I: a = 9.046(1) Å, b = 15.669(3) Å, c = 12.333(3) Å at 293 K.
Phase III: a = 9.041(2) Å, b = 15.626(6) Å, c = 24.661(6) Å, α = 89.96(3)° at 273 K.
Phase IV: a = 9.037(2) Å, b = 15.589(3) Å, c = 36.973(11) Å, γ = 90.22(2)° at 261 K.
Phase V: a = 8.977(3) Å, b = 15.334(7) Å, c = 12.216(6) Å, β = 90.16(3)° at 168 K.

b Z = 4, 8, 12, 4 in phases I, III, IV and V, respectively. 89Mas
Crystal structure: Fig. 39A-4-001, Fig. 39A-4-002, Fig. 39A-4-003, Fig. 39A-4-004.
Positional and temperature parameters: Table 39A-4-001, Table 39A-4-002, Table 39A-4-003, Table 39A-4-004.
Interatomic distances and bond angles: Table 39A-4-005, Table 39A-4- 006, Table 39A-4-007, Table 39A-4-008.

4 Thermal expansion: Fig. 39A-4-005.

5a Dielectric constant: Fig. 39A-4-006, Fig. 39A-4-007, Fig. 39A-4-008.
Phase diagram in regard to p: Fig. 39A-4-009, Fig. 39A-4-010;
see also 84Ges

6a Heat capacity: Fig. 39A-4-011.
Transition heat, transition entropy: Table 39A-4-009.

8a Elastic stiffness constant and absorption coefficient: Fig. 39A-4-012, Fig. 39A-4-013, Fig. 39A-4-014, Fig. 39A-4-015.
Influence of hydrostatic pressure on the sound wave: see 90Vlo1, 90Vlo2

9a Birefringence: Fig. 39A-4-016.
Infrared absorption spectra: see 85Gan
Absorption, emission spectra: see 90Mar

14a Bragg reflection due to structural modulation: Fig. 39A-4-017, Fig. 39A-4-018.
For high resolution measurement at 21 °C see also 96Shi1
Distribution of modulation wavenumber in p–T phase diagram: Fig. 39A-4-019.