substance: V_nO_{2n-1}: n ≥ 3
property: electronic and lattice properties, optical and magnetic data

No band-structure calculations appear to be available.
Optical spectra; Fig. 1, optical bandgap for V_3O_5: 0.62 eV at RT [78C].

magnetic data for several V_nO_{2n-1} compounds

(see also Figs. 2, 3. Data from [73K, 79N1, 79N2])

V_nO_{2n-1}	T_{tr} a)	T_N b)	$T > T_{tr}$						$T_{tr} > T > T_N$	
	K	K	C_{obs} cm³Kmol⁻¹	C_{calc} c) cm³Kmol⁻¹	p_{eff} μ_B	Θ_p K	χ_m d)·10⁴ cm³mol⁻¹	$g(E_F)$ e)	C_{obs} cm³Kmol⁻¹	p_{eff} μ_B
V_2O_3	155	155	0.82	0.98	2.96	– 600	320	9.8	–	–
V_3O_5	430	76	0.78	0.77	2.51	– 97	85	–	–	–
V_4O_7	238	33.3	0.57	0.67	2.14	– 20(10)	275	8.6	0.057	0.699
V_5O_9	135	28.8	0.57	0.61	2.13	– 18	290	9.0	0.056	0.674
V_6O_{11}	170	24.0	0.53	0.58	2.06	– 30(10)	287	8.8	0.24	1.364
V_7O_{13}	–	43.0	0.52	0.55	2.04	– 38	162	5.0	–	–
V_8O_{15}	68	6.1	–	–	–	–	–	–	–	–
VO_2	340	–	0.68	0.37	2.33	– 629	61	1.9	–	–

a) Transition temperature.
b) Néel temperature.
c) C_{calc} is the Curie constant calculated assuming the localized V^{3+} and V^{4+} ions.
d) For $T > T_{tr}$, $\chi_m \approx \chi_{m0} + C_m/(T-\Theta_p)$.
e) State density of electron (electrons per eV per V atom) at Fermi level E_F; calculated assuming Pauli paramagnetism for χ_m.

V_3O_5 is apparently a low-dimensional magnet [80G, 77U]. Although the susceptibility peaks at 120 K, the Néel temperature is known to be 75 K from NMR data. The magnetic susceptibility shows a discontinuity at 430 K (Fig. 4).

IR phonon wavenumbers

(ν/c)	710 cm⁻¹ (696 cm⁻¹)	V_3O_5, RT	figure in brackets refers to	80R
	587 cm⁻¹ (585 cm⁻¹)		stretching frequency in	
	537 cm⁻¹ (528 cm⁻¹)		20 at % ¹⁸O doped material	
	492 cm⁻¹ (487 cm⁻¹)			
	462 cm⁻¹ (459 cm⁻¹)			

References:

72K Kachi, S.: AIP Conf. Proc. 10 (1972) 714.
72P Porter, V. R., White, W. B., Roy, R.: J. Solid State Chem. 4 (1972) 250.
73K Kachi, S., Kosuge, K., Okinaka, H.: J. Solid State Chem. 6 (1973) 258.
77U Ueda, Y., Kosuge, K., Kachi, S.: Mater. Res. Bull. 12 (1977) 763.
78C Chudnovskii, F. A., Terukov, P. I.: Solid State Commun. 25 (1978) 573.
79N1 Nagata, S., Griffing, B. F., Khattak, G. D., Keesom, P. H.: J. Appl. Phys. 50 (1979) 7575.
79N2 Nagata, S., Keesom, P. H., Faile, S. P.: Phys. Rev. B20 (1979) 2886.
80G Griffing, B. F., Faile, S. P., Honig, J. M.: Phys. Rev. B21 (1980) 154.
80R Reichelt, W., Oppermann, H., Wagner, H., Terukov, E. I., Wolf, E.: Z. Anorg. Allg. Chem. 463 (1980) 193.
81N Nagata, S., Keesom, P. H., Kuwamoto, H., Otsuka, N., Sato, H.: Phys. Rev. B23 (1981) 411.

Fig. 1.

V_nO_{2n-1}. Absorption spectra (absorbance *A* vs. wavelength) at RT [72P]. Wavenumbers of the maxima are also given.

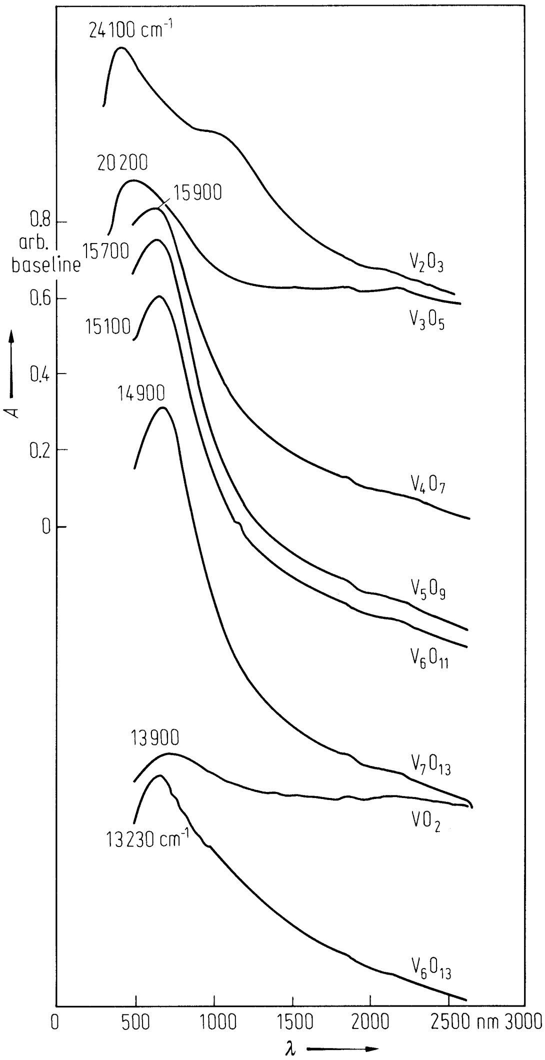

Fig. 2.

V_nO_{2n-1}. Magnetic mass susceptibility of polycrystals vs. temperature [72K]. Fig. b shows high temperature range. χ_g in CGS-emu.

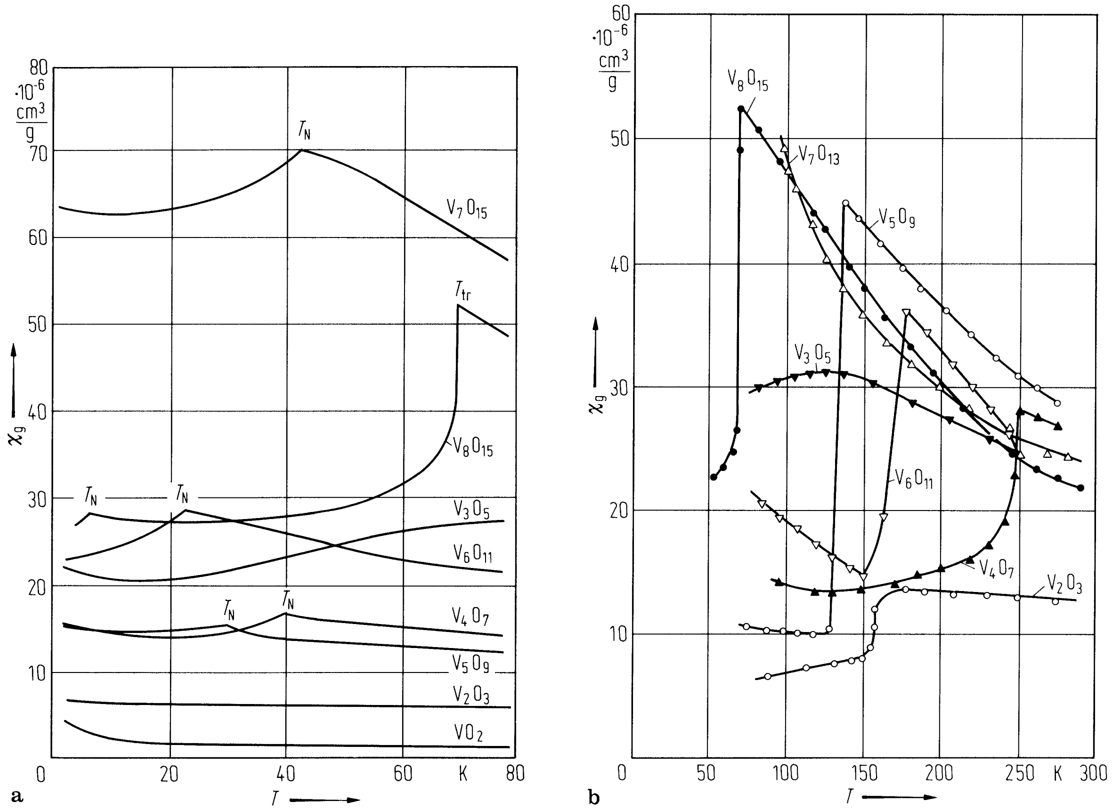

Fig. 3.

V_9O_{17}. Low-field magnetic mass susceptibility of polycrystals vs. temperature. The metal-insulator transition is arrowed [81N].

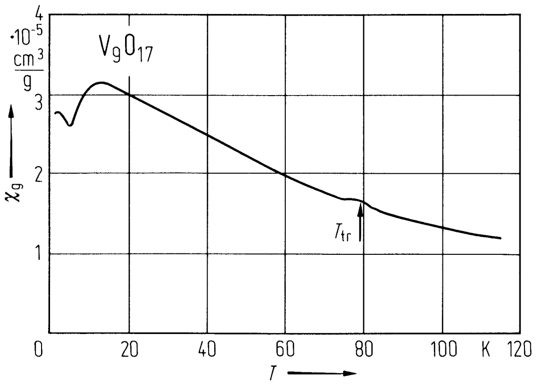

Fig. 4.

V_3O_5. Reciprocal magnetic susceptibility of monocrystals vs. temperature [78C]. χ_g in CGS-emu. Orientation not specified.