substance: V_2O_5
property: transport properties, intermediate temperature range

V_2O_5 shows three quite distinct conductivity regions (Fig. 1): a low-temperature region ($T \leq 140$ K) of very low activation energy, an intermediate region (140 K $\leq T \leq$ 350 K) where good linearity in the ln ρ vs. T^{-1} curve is obtained, and a final high-temperature region (350 K $\leq T \leq$ 600 K) where substantial non-linearity is found [70I, 73H, 71P].

intermediate temperature range (140...400 K)

activation energy for conductivity

E_A	0.27 eV	70I
	0.26 eV	73H
	0.170...0.189 eV	71P
	0.21...0.29 eV	65P
	0.20...0.24 eV	72V
	0.28 eV	71S
	0.22...0.32 eV	69V
	0.19...0.21 eV	70N

The conductivity remains anisotropic (Fig. 2). Seebeck coefficient shows anomalous behaviour (Fig. 3) which has been interpreted in [71P] in terms of a two level system. Analysis suggests for the activation energy two contributions: a hopping energy (polaron energy) of 0.15...0.17 eV and an energy required to free an electron from an impurity trap of 0.10...0.12 eV [70I].

Hall mobility

μ_H	$3 \cdot 10^{-2}$ cm^2/V s	T = 298 K, $\parallel c$	shows smaller temperature dependence than conductivity,	70I
	0.2 cm^2/V s	RT, $\perp c$	a decreasing temperature	71P
	$3.5 \cdot 10^{-2}$ cm^2/V s	T = 328 K, $\parallel c$	dependence is shown in Fig. 4	70I
	$3.8...9.7 \cdot 10^{-2}$ cm^2/V s	T = 293 K	$\mu_H \propto T^{-3}$; orientation not specified	72V

drift mobility

μ_{dr}	$\mu_o \exp(-0.26 \text{ eV}/kT)$	along b-axis	see Fig. 5; in the a-direction	69V
	$\propto \mu_0 T^{0.32}$	along c-axis	the mobility decreases with	
	$\propto \mu_0 T^{-1.25}$	along a-axis	temperature (T in K)	
	0.1...0.8 cm^2/V s	T = 293 K	orientation not specified	72V

References:

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70I Ioffe, V. A., Patrina, I. B.: Phys. Status Solidi 40 (1970) 389.
70N Nagels, P., Denayer, M.: Proc. 10th Int. Conf Semiconductors 1970, 321.
71P Perlstein, J. H.: J. Solid State Chem. 3 (1971) 217.
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Fig. 1.

V_2O_5. Conductivity vs. reciprocal temperature for (1) along *c*-axis (2) along *b*-axis [70I].

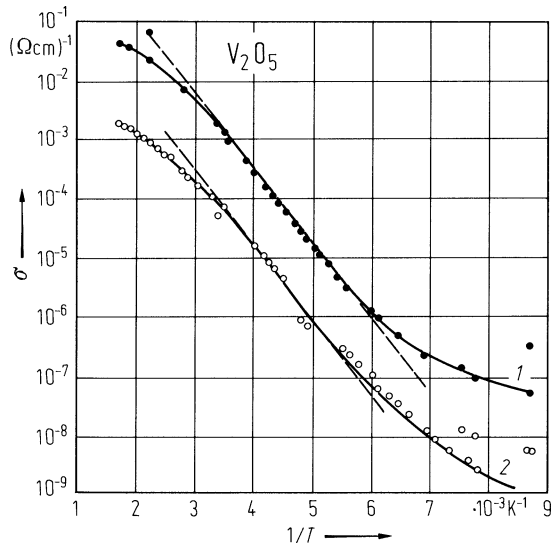

Fig. 2.

V_2O_5. Conductivity vs. reciprocal temperature for low temperatures along the three crystallographic directions [73H].

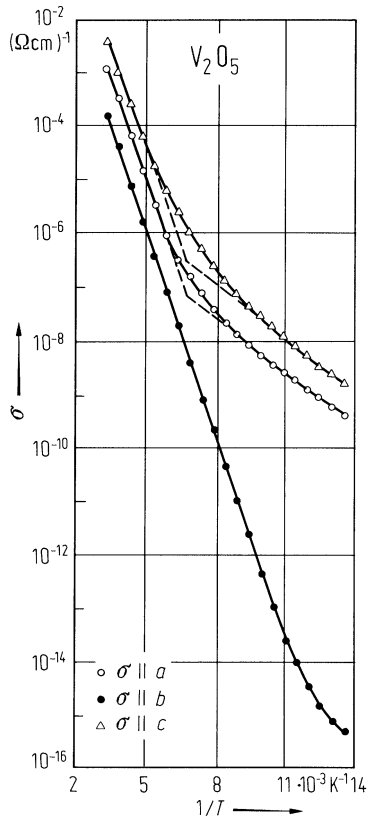

Fig. 3.

V_2O_5. Seebeck coefficient vs. temperature for four crystals. (4') is measured on the same crystal as (4) after annealing [70I]. Orientation not specified.

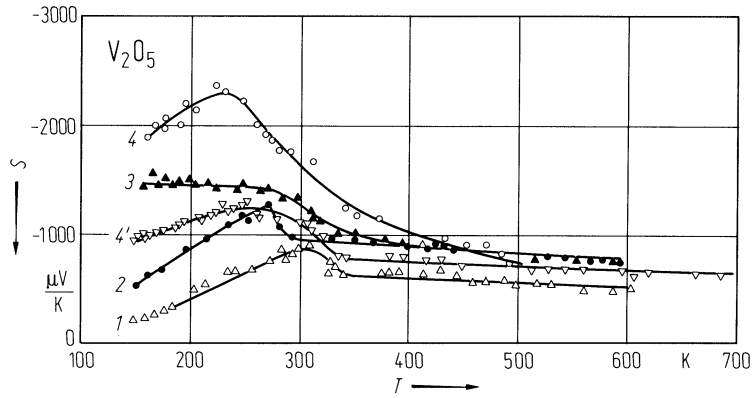

Fig. 4.

V_2O_5. Seebeck coefficient, conductivity, drift and Hall mobility vs. temperature [72V]. Orientation not specified, assumed to be ‖ *a*.

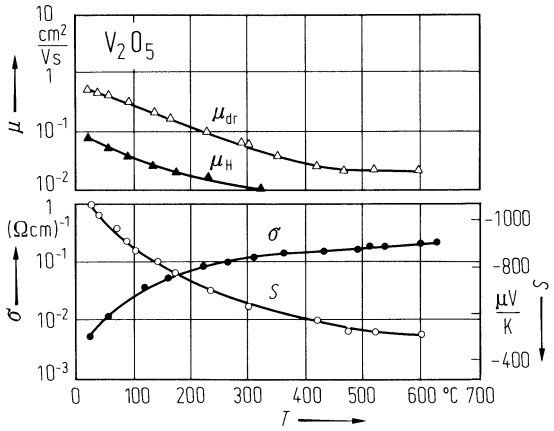

Fig. 5.

V_2O_5. Carrier drift mobility vs. temperature (1) along *c*-axis, (2) along *a*-axis, (3) along *b*-axis [69V].