substance: MnO
property: transport data, effects of stoichiometry, doping

dependence of transport parameters on stoichiometry: conductivity: Fig. 1, Seebeck coefficient: Fig. 3. (For μ, ρ and S of MnO, see also Figs. 4, 5, 8,9)

effect of n-type dopants: Fig. 2.

transport in Li-doped MnO: electrical resistivity of Li-doped samples: Fig. 5, 6, Hall coefficient: Fig. 6, Hall mobility: Fig. 7, Seebeck data: Fig. 8.

The Hall mobility of Fig. 7 is essentially identical to that reported in [68A], though the risks of comparing data on ceramic Li-doped samples with data on pure single crystals have been emphasized [81P]. Above 500 K the Hall mobility is constant suggesting that all the observed activation energy in the conductivity is due to freeing the holes from the $Mn_{Mn}^{\cdot} - Li_{Mn}'$ sites. This interpretation is not supported by the thermopower data of Fig. 8. The slope of S vs. $1/T$ differs from ln ρ vs. $1/T$ suggesting an activated mobility of activation energy 0.25...0.30 eV [70C] which lies between the values quoted above [67H, 71B, 81P]. The trapping energy of the $Li_{Mn}' - Mn_{Mn}^{\cdot}$ trap is 0.4 eV [70C] in the range RT...1000 K if the mobility is activated, and the mobility of holes derived from these traps is 0.01 $cm^2/V\,s$ at 1000 K [70C] and $3 \cdot 10^{-5}$ $cm^2/V\,s$ at 300 K. This compares with a Hall mobility of $3...8 \cdot 10^{-2}$ $cm^2/V\,s$ in the T-range 350...750 K [70C]. The apparently larger Hall mobility may be a consequence of the small-polaron nature of these holes.

References:

67H Hed, A. Z., Tannhauser, D. S.: J. Chem. Phys. 47 (1967) 2090.

67N Nagels, P., Denayer, M.: Solid State Commun. 5 (1967) 193.

68A Ali, M., Fridman, M., Denayer, M., Nagels, P.: Phys. Status Solidi 28 (1968) 193.

70C Crevecoeur, C., de Wit, H. J.: J. Phys. Chem. Solids 31 (1970) 783.

70O O'Keeffe, M., Valigi, M.: J. Phys. Chem. Solids 31 (1970) 947.

71B Bransky, I., Tallan, N. M.: "Conduction in Low-mobility Materials", Klein, N., Tannhauser, D. S., Pollak, M. (eds.), London: Publ. Taylor, 1971, p. 31.

81P Pai, M., Honig, J. M.: J. Solid State Chem. 40 (1981) 59.

Fig. 1.

MnO_{1+x}. Isotherms of the conductance $1/R$ of polycrystalline material for regions B and C of Fig. 9 vs. x in MnO_{1+x} [67H].

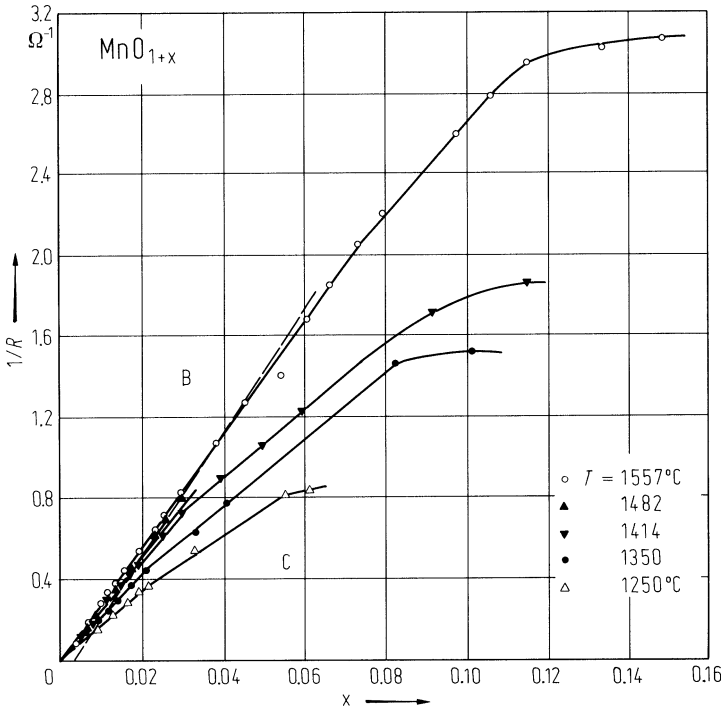

Fig. 2.

MnO:Cr. Relative conductivity $\sigma_{rel} = \sigma/\sigma_{min}$ (1000°C) at three temperatures vs. oxygen partial pressure for pure and Cr doped samples. Numbers on curves correspond to at% Cr/Mn [70O].

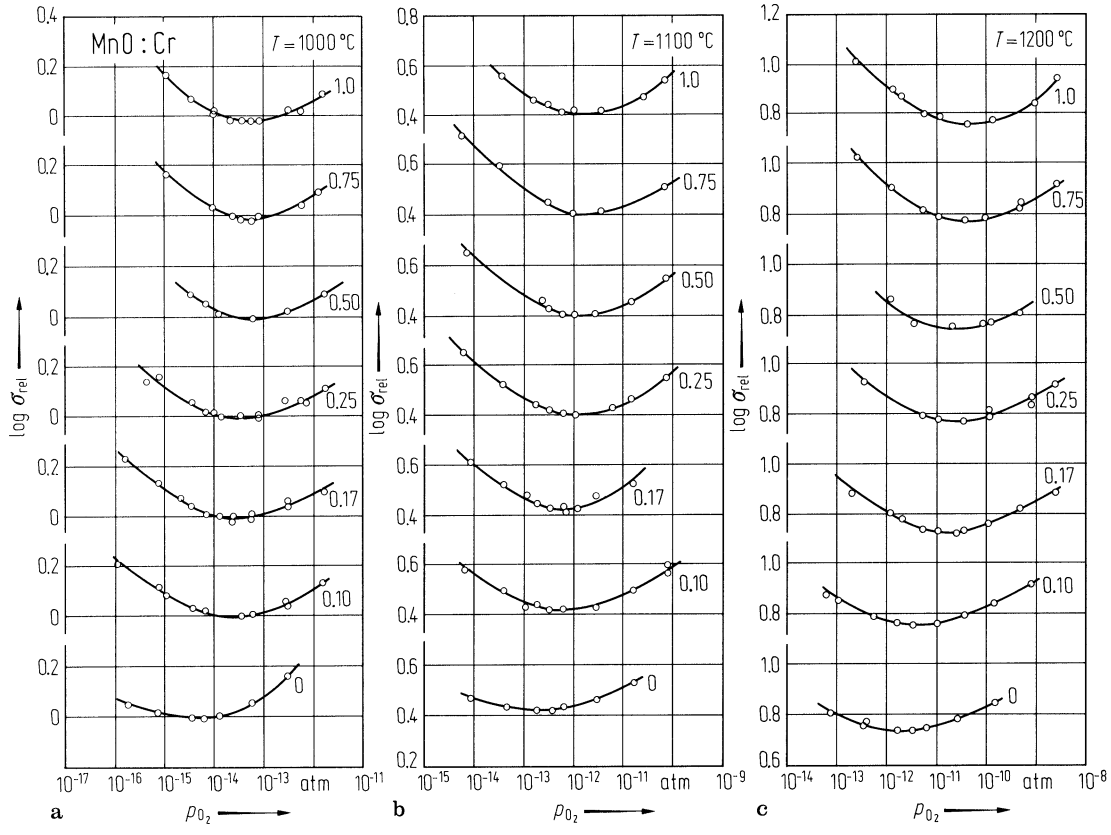

Fig. 3.

MnO. Seebeck coefficient vs. oxygen partial pressure for single crystals at various temperatures [67H].

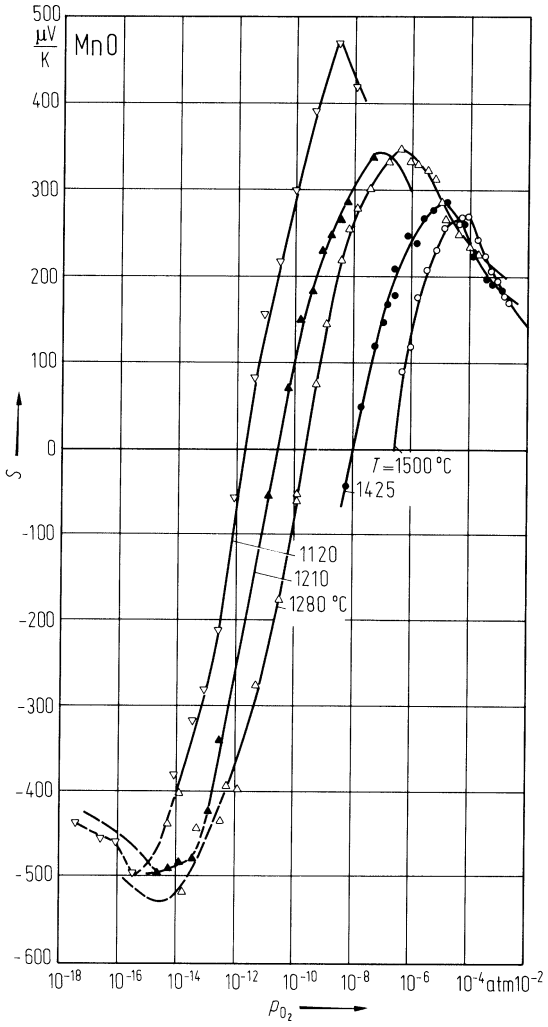

Fig. 4.

MnO. Hole mobility (in $cm^2\ V^{-1}\ s^{-1}$) and constants K_{ox} (in $atm^{1/2}$) and K_{Cr} vs. reciprocal temperature [70O].

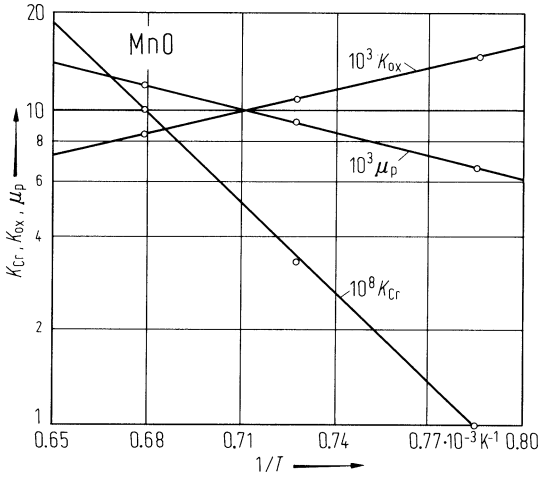

Fig. 5.

MnO:Li. Resistivity vs. reciprocal temperature. Curve *1* pure single crystal, *2* 0.03 at% Li doped, *3* 0.1 at% Li doped, *4* 5.0 at% Li doped [70C].

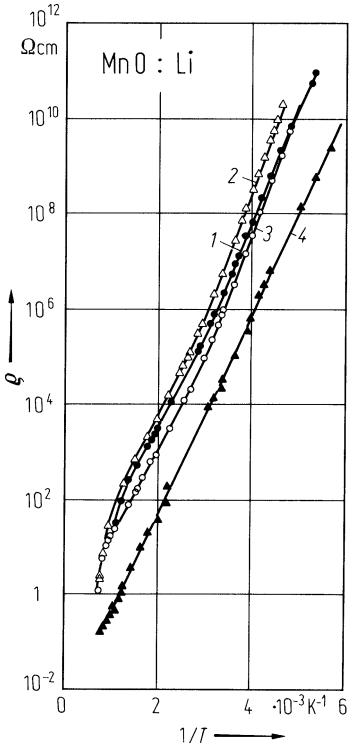

Fig. 6.

$Li_{0.001}Mn_{0.999}O$. Resistivity and Hall coefficient vs. (reciprocal) temperature for three single crystals [67N].

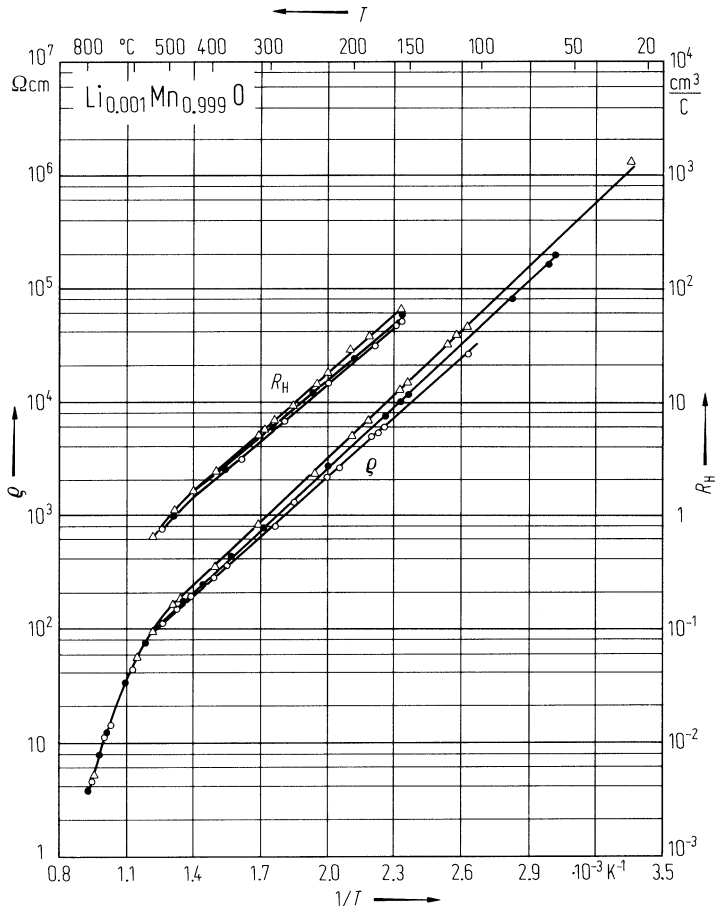

Fig. 7.

$Li_{0.001}Mn_{0.999}O$. Hall mobility of holes for three single crystals vs. (reciprocal) temperature [67N].

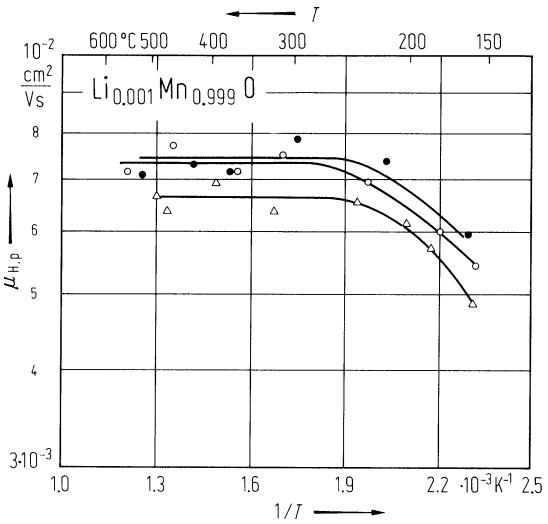

Fig. 8.

MnO:Li. Seebeck coefficient (reduced) vs. reciprocal temperature for three samples of Fig. 5 [70C].

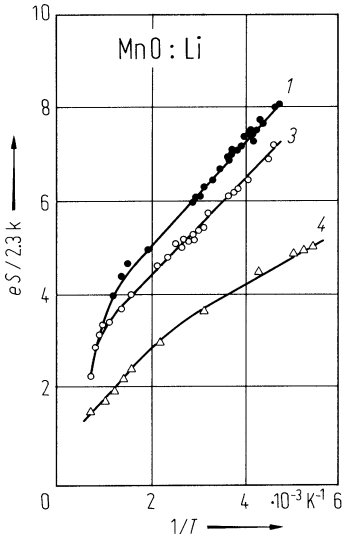

Fig. 9.

MnO. Conductance vs. CO_2/CO pressure ratio of ambient atmosphere during measurement for single crystals. The regions A, B and C delineate regions of differing behaviour and the numbers refer to the different exponents n as $1/R \propto p_{O2}^{1/n}$ [67H].