substance: NiO
property: carrier mobility, pure NiO

Seebeck coefficient: Fig. 1. Comparison of Hall and drift mobilities: Fig. 2. The calculated drift mobility was an order of magnitude larger than the Hall mobility for Li doped samples ($\mu_{dr}/\mu_H \approx 10$ at 300 K) [67A], leading to $m^{**} \approx 12...36\ m_0$, polaron coupling constant $\alpha \approx 6$. High temperature pure single crystal data give an activated mobility of the form $\mu_p = 15959/T$ [K] exp(–0.37 eV/kT) [cm^2/V s].

Mobility data of Figs. 1, 2 are representative, but considerably higher values (20...50 cm^2/V s at RT) have been reported using transient techniques: Fig. 3. From these data, $m^{**} = 1.5\ m_0$ and $\alpha = 1.6$. Far smaller values of μ_{dr} have also been reported [78K1] ranging from < 10^{-2} cm^2/V s at 1000 K to as little as 10^{-5} cm^2/V s at 300 K and a marked kink at T_N [78K1].

These values could only be consistent with a hopping type of mobility, and would make the observation of photoconductivity most unlikely. However, disagreement in the literature exists about the appearance [65K, 67M] or non-appearance [70P, 78K2, 75K] of photocurrent at the optical threshold.

At intermediate temperatures, the Hall mobility changes sign, usually at a temperature near T_N, though this is strongly dependent on sample stoichiometry (Fig. 4). A quantitative treatment led to a thermal bandgap of only 1.7 eV, substantially lower than that observed optically [75F].

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Fig. 1.

NiO:Li. Seebeck coefficient vs. (reciprocal) temperature for several pure and Li doped crystals. at% Li: *1* 0, *2* 0, *3* 0.032, *4* 0.202, *5* 0.211, *6* 0.537 [67A].

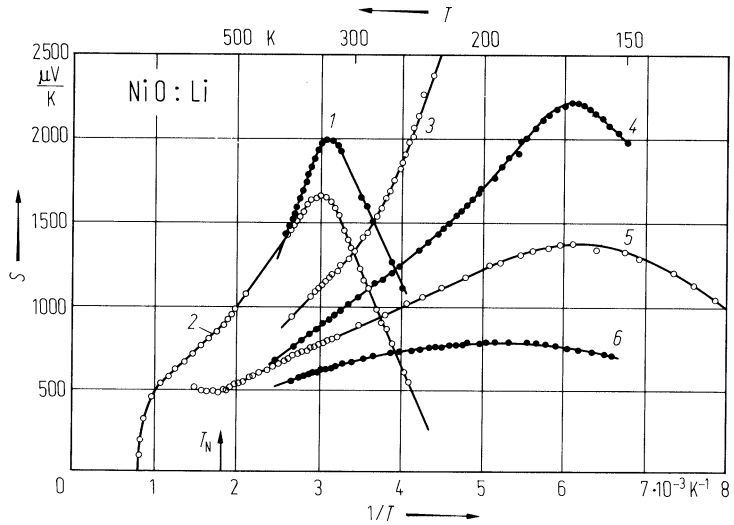

Fig. 2.

NiO: Li. Hall and drift mobilities for holes vs. reciprocal temperature. —— single crystal data for Li doped samples [67A], --- ceramics, 0.088...0.005 at% Li [66B], -·-·- single crystals pure or 0.002 at% Li [64R]; at% Li: *1* 0.03, *2* 0.21, *3* 0.202, *4* 0.537 [67A].

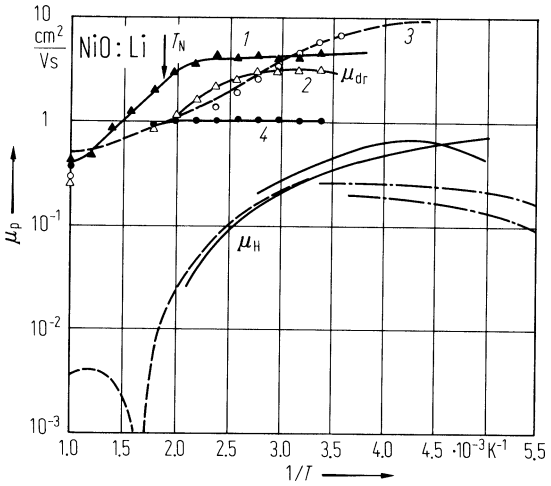

Fig. 3.

NiO. Hole drift mobility vs. reciprocal temperature for two specimens [73S].

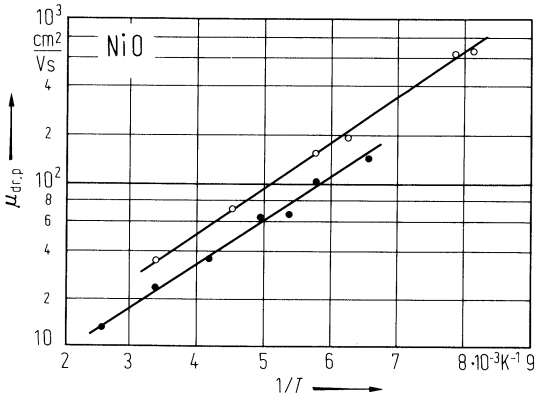

Fig. 4.

NiO. Resistivity and Hall mobility vs. (reciprocal) temperature for different partial pressures of O_2 (between 10^{-3} and 10^{-1} atm). Two methods of analysing the signal were presented [75F].