substance: FeO ($Fe_{1-x}O$)
property: Seebeck coefficient

See Fig. 1. Unusual switch from positive to negative values as the deviation from stoichiometry increases [70S] which could be understood within a complex defect model of the form $Fe_c = Fe_i^{3+} (V_{Fe})_2$ as described above. If $\beta = [Fe_c']$, then the formula $S = k/e[\ln[(1-4\beta)/\beta^{1/2}]+A]$ can be derived for S [70S]. However, a best fit to the data of Fig. 1 gives $A = -0.89$ ($\approx$ 1000...1300°C). This is ascribed to "negative phonon drag". Given that the change from p- to n-type behaviour coincides with a change in the Moessbauer spectrum [69J] it is more probable that clustering of defects is responsible. The p – n transition can also be suppressed by doping with magnesium [67H, 67B] (Fig. 2).

References:

67B Bransky, I., Tannhauser, D. S.: Physica 37 (1967) 547.
67H Hillegas, W. J., Wagner, J. B.: Phys. Lett. A25 (1967) 742.
69J Johnson, D. P.: Solid State Commun. 7 (1969) 1785.
70S Seltzer, M. S., Hed, A. Z.: J. Electrochem. Soc. 117 (1970) 815.

Fig. 1.

$Fe_{1-x}O$. Seebeck coefficient vs. oxygen partial pressure at various temperatures [70S]. Solid lines fit to the data (see tables).

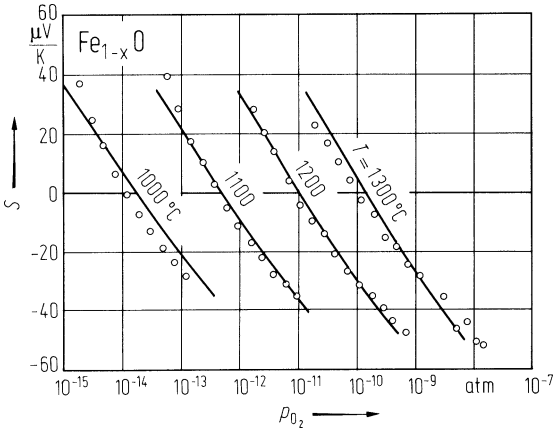

Fig. 2.

$Fe_{1-x}O$:Mg. Seebeck coefficient vs. CO_2/CO pressure ratio of ambient atmosphere during measurement for various Mg doped samples [67H].