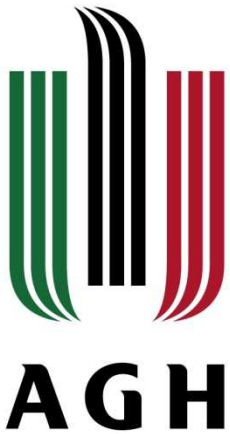

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SULPHIDATION OF METALLIC MATERIALS

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Literature

Z. Grzesik and K. Przybylski, „Sulfidation of metallic materials” w „Developments in high temperature corrosion and protection of materials”, Eds. Wei Gao and Zhengwei Li, Woodhead Publishing Limited, Cambridge England, 2008, str. 599-638.

Properties of selected metal sulfides and oxides

Sulfide	ΔG^0_{1273K} [kJ/mol S]	p_{S_2} [Pa]	Oxide	ΔG^0_{1273K} [kJ/mol O]	p_{O_2} [Pa]
Al_2S_3	-191	$2.4 \cdot 10^{-11}$	Al_2O_3	-424	$1.8 \cdot 10^{-30}$
CoS	-43.8	26	CoO	-145	$1.2 \cdot 10^{-7}$
Cu_2S	-95.7	$1.4 \cdot 10^{-3}$	Cu_2O	-77.7	$4.3 \cdot 10^{-2}$
CuS	63.6	$1.6 \cdot 10^{10}$	CuO	-11.6	$1.1 \cdot 10^{4}$
FeS	-78.9	$2.9 \cdot 10^{-2}$	FeO	-179	$2.3 \cdot 10^{-10}$
MnS	-196.9	$7.3 \cdot 10^{-12}$	MnO	-292	$1.2 \cdot 10^{-19}$
MoS_2	-78.3	$3.8 \cdot 10^{-2}$	MoO_2	-182	$1.3 \cdot 10^{-10}$
NiS	-50.4	7.5	NiO	-127	$3.8 \cdot 10^{-6}$
TiS	-228	$2.1 \cdot 10^{-14}$	TiO	-420	$3.9 \cdot 10^{-30}$

Properties of selected metal sulfides and oxides

Sulfide	Melting point [K]	Oxide	Melting point [K]
Al_2S_3	1373	Al_2O_3	2288
CoS	1389	CoO	2068
Co_3S_4	?	Co_3O_4	1223
Cr_2S_3	1623	Cr_2O_3	2539
Cu_2S	1373	Cu_2O	1508
CuS	376	CuO	1599
FeS	1472	FeO	1642
MnS	1598	MnO	2058
MoS_2	1458	MoO_2	2200
NiS	1083	NiO	2230
TiS	2373	TiO	2023
TiS_2	?	TiO_2	2123
La_2S_3	2423	La_2O_3	2490
Ce_2S_3	2373	Ce_2O_3	1965
ThS_2	2198	ThO_2	3593

Sulfide	Melting point [K]	Oxide	Melting point [K]
US_2	1373	UO_2	3151
Y_2S_3	1873	Y_2O_3	2683
InS	965	InO	1325
In_2S_3	1323	In_2O_3	2273

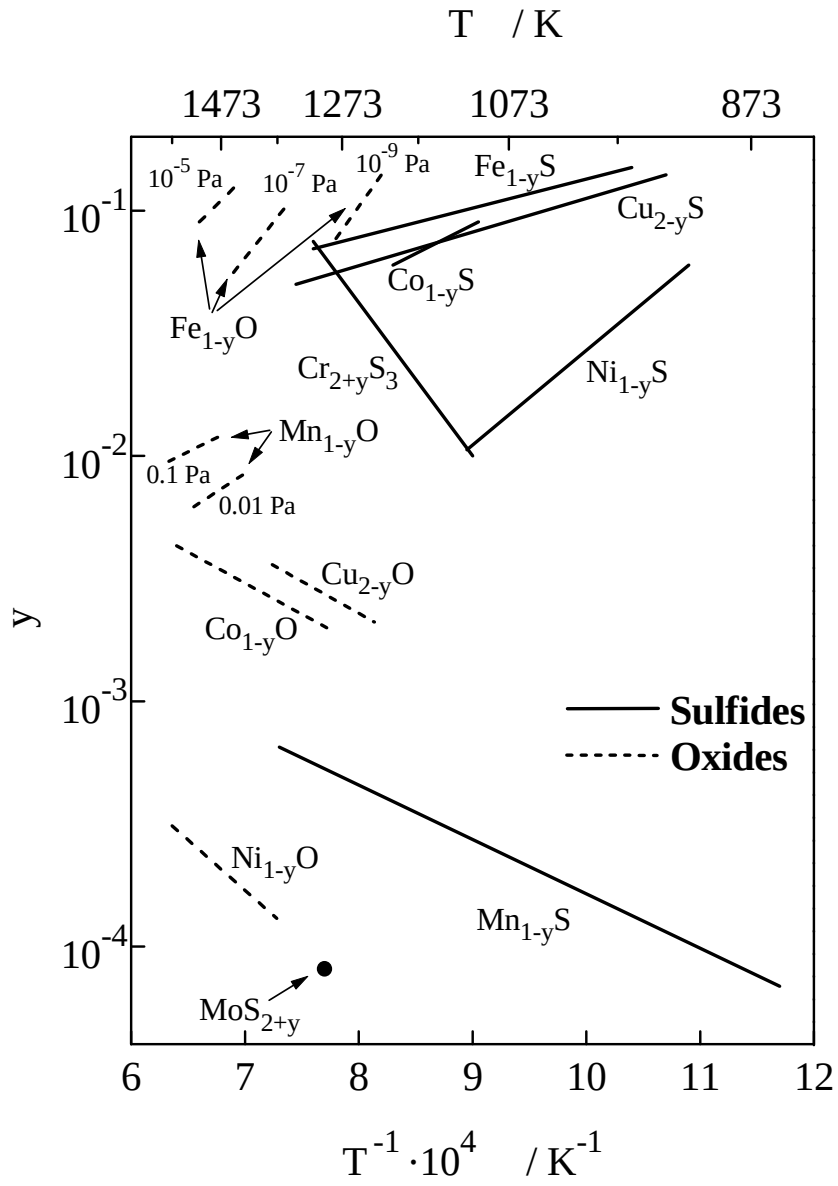
Properties of selected metal sulfides and oxides

Metal	Sulfides	Oxides
Co	Co_4S_3	CoO
	Co_9S_8	Co_3O_4
	CoS	
	Co_3S_4	
	CoS_2	
Cr	CrS	Cr_2O_3
	Cr_7S_8	
	Cr_5S_6	
	Cr_3S_4	
	Cr_2S_3	
Ni	Ni_3S_2	NiO
	Ni_7S_6	
	NiS	
	Ni_3S_4	
	NiS_2	

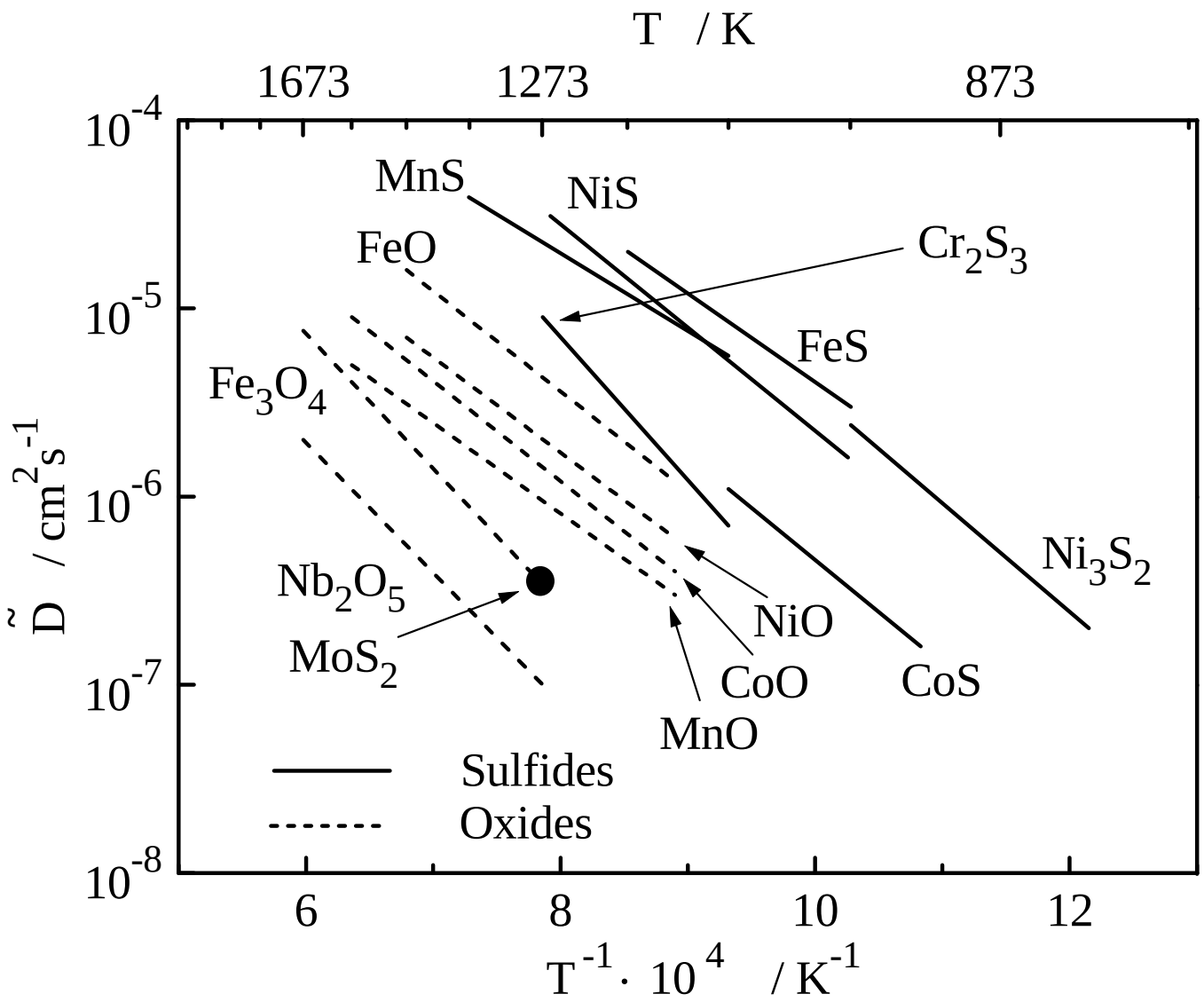
Deviation from stoichiometry in selected metal sulfides and oxides

Sulfide	y	Oxide	y
$Co_{1-y}S$	0.16	$Co_{1-y}O$	0.009
$Cr_{2+y}S_3$	0.18	$Cr_{2-y}O_3$	0.00009
$Cu_{2-y}S$	0.17	$Cu_{2-y}O$	0.004
$Fe_{1-y}S$	0.24	$Fe_{1-y}O$	0.12
$Mn_{1-y}S$	0.002	$Mn_{1-y}O$	0.016
$Ni_{1-y}S$	0.17	$Ni_{1-y}O$	0.0006

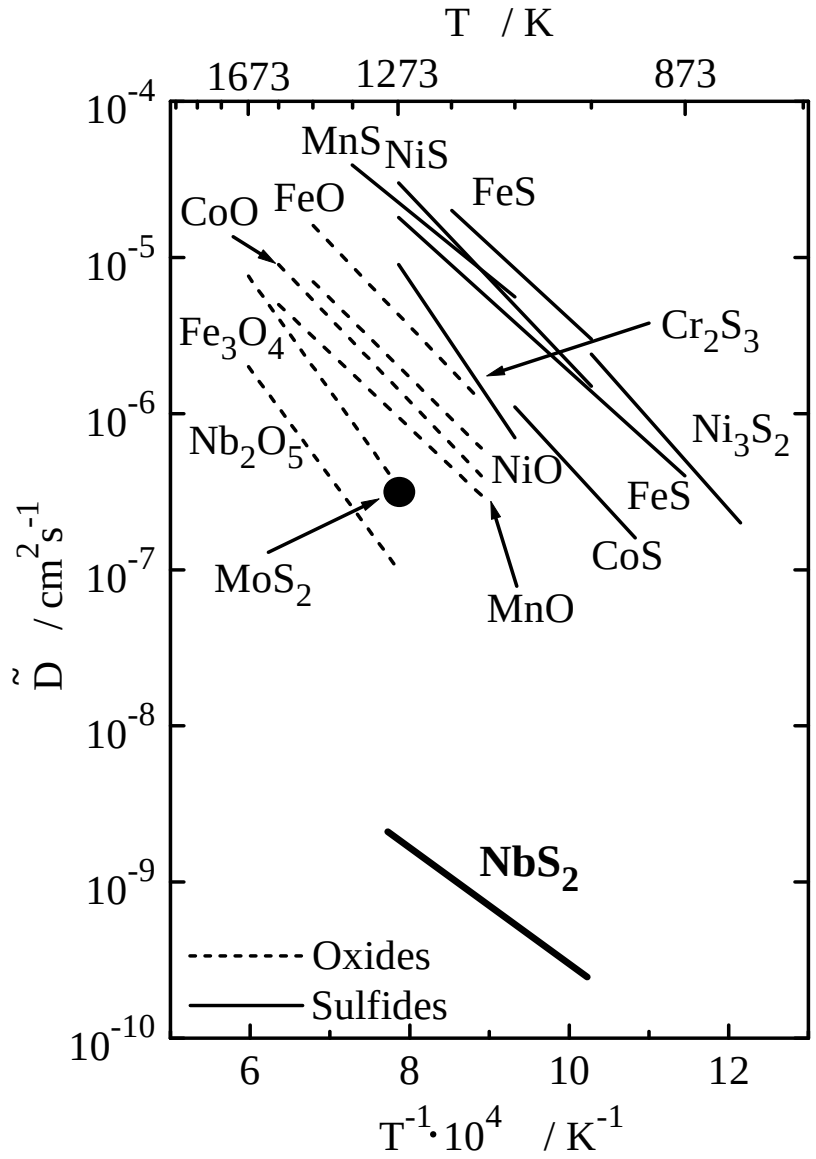
Deviation from stoichiometry in selected metal sulfides and oxides



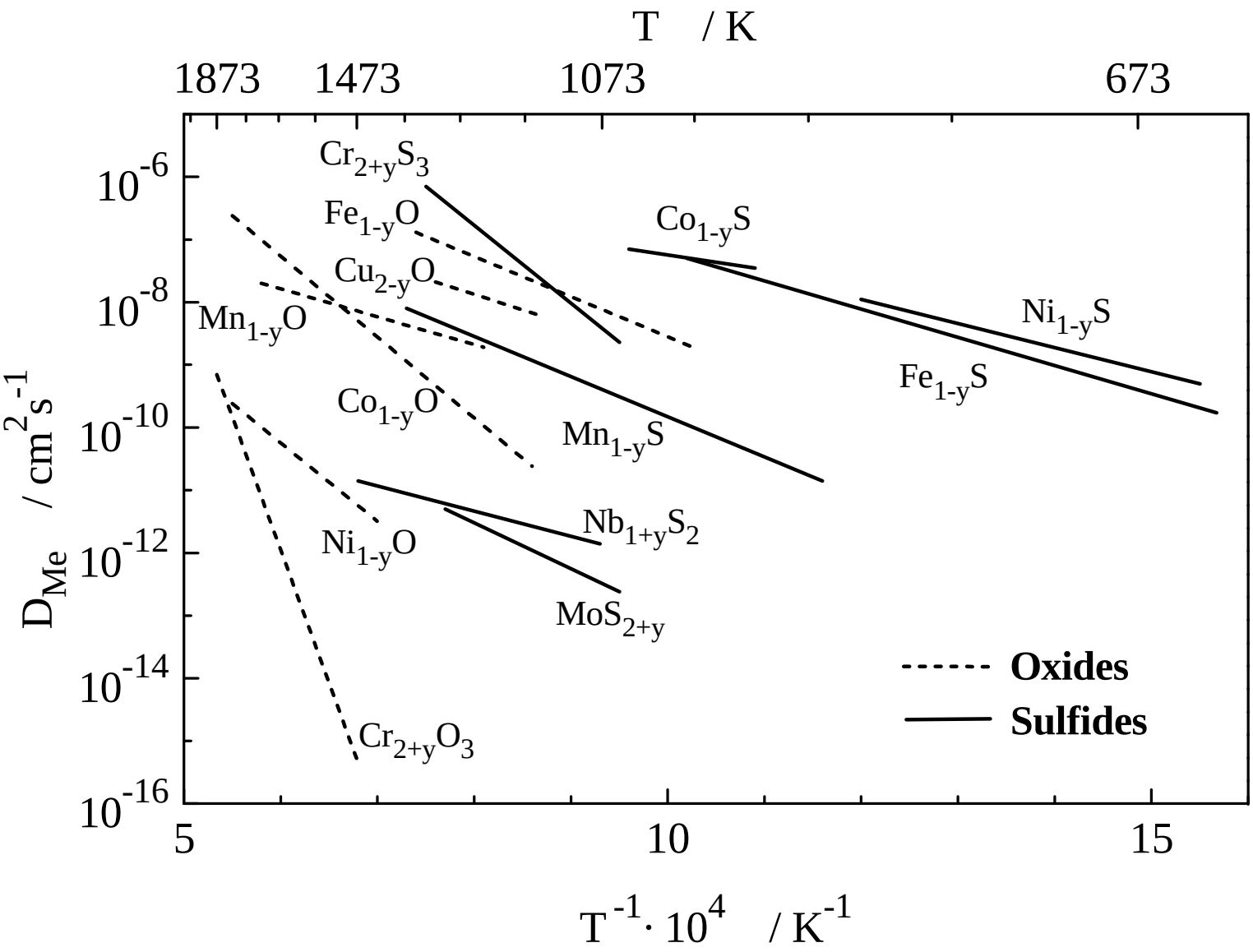
Chemical diffusion in selected metal sulfides and oxides



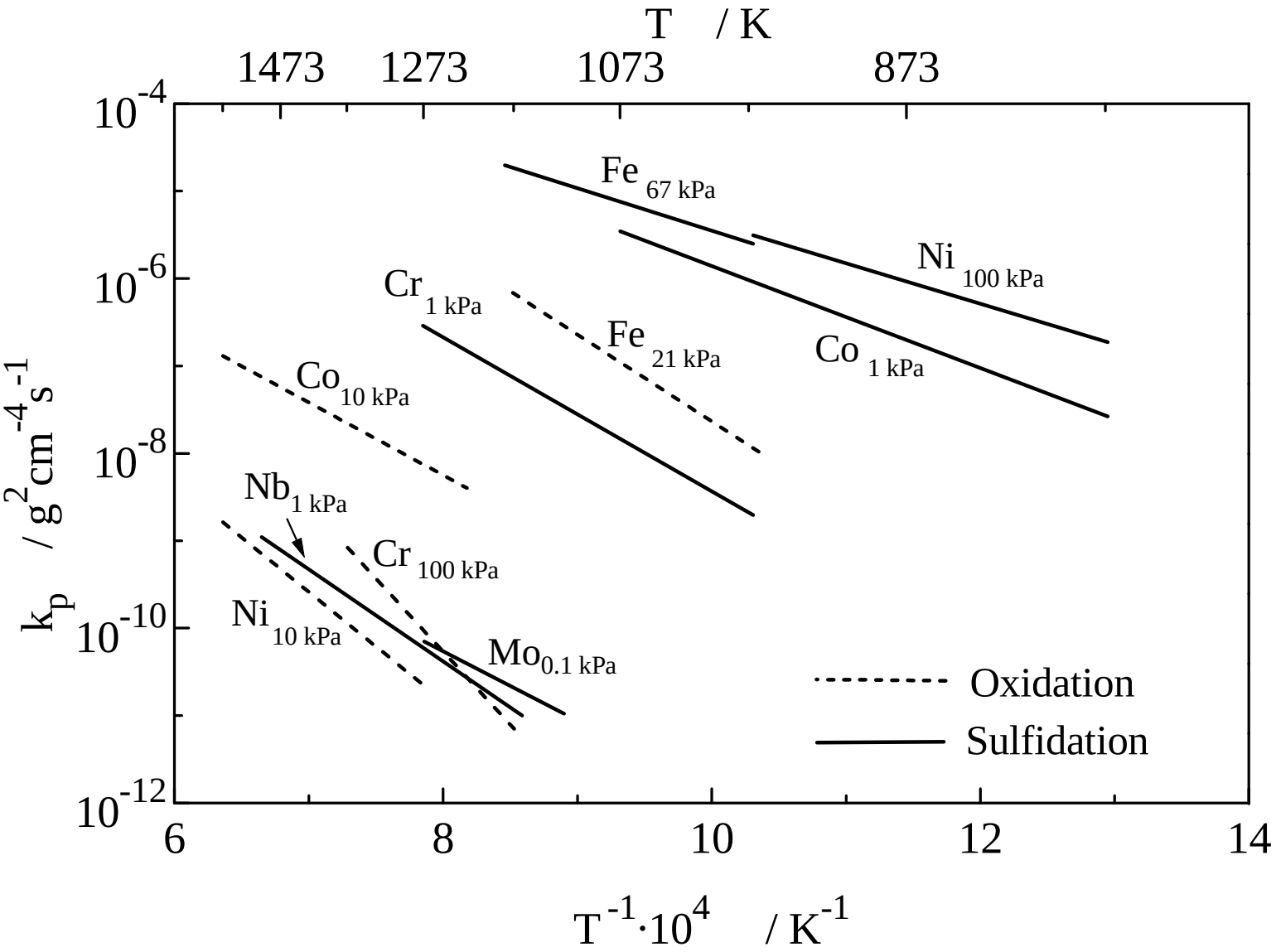
Chemical diffusion in selected metal sulfides and oxides



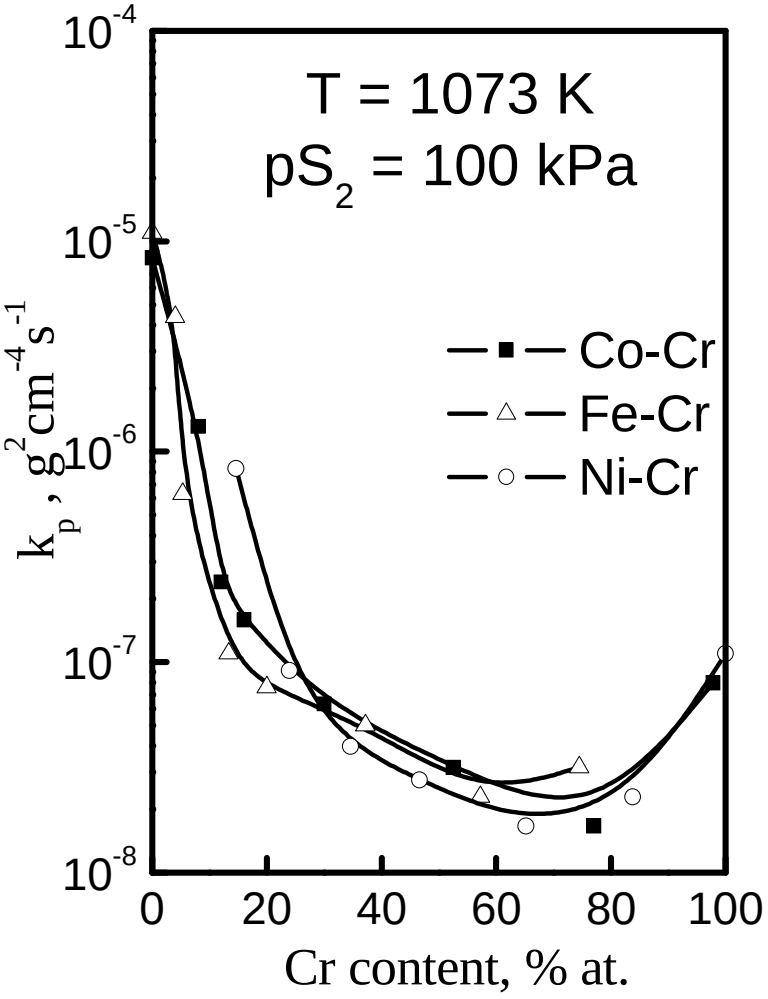
Temperature dependence of self-diffusion coefficients for several metal sulfides and oxides

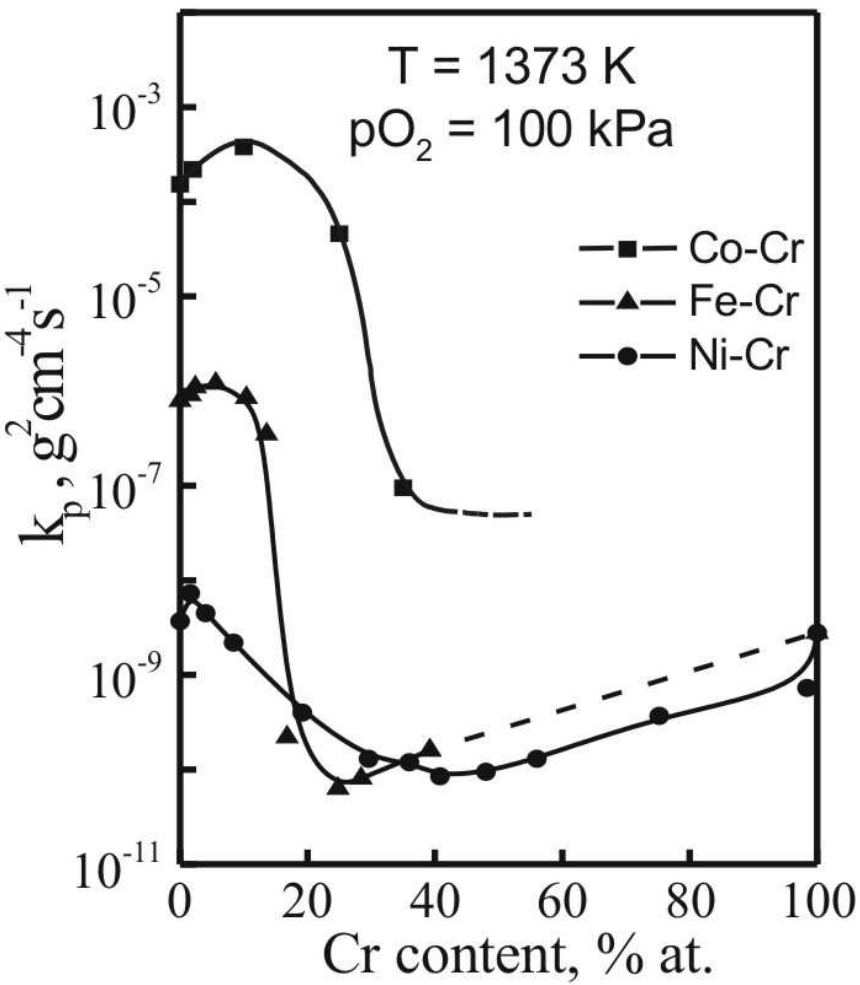


Comparison between metal sulphidation and oxidation rates

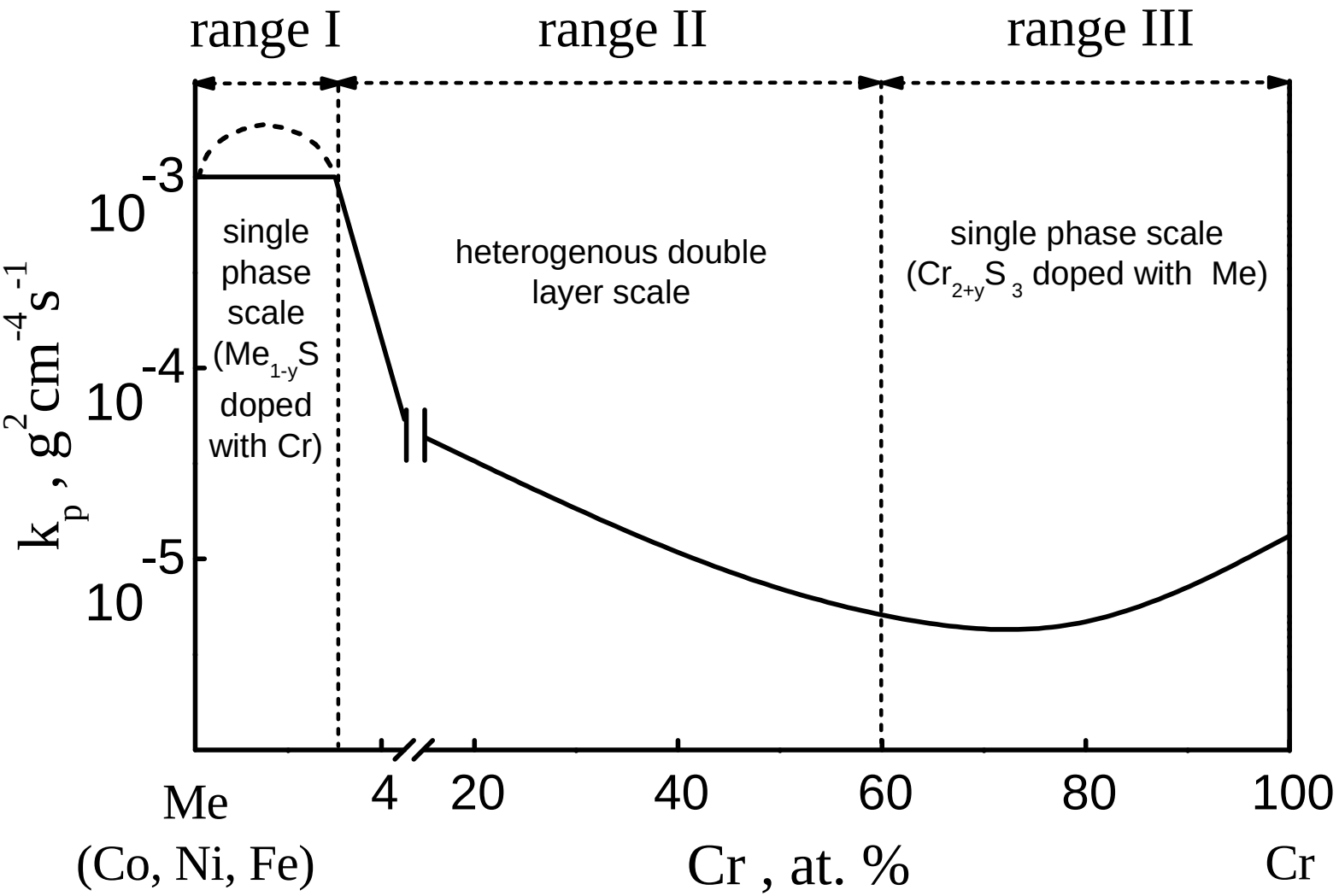


Influence of Cr on the sulphidation and oxidation rate of different metals

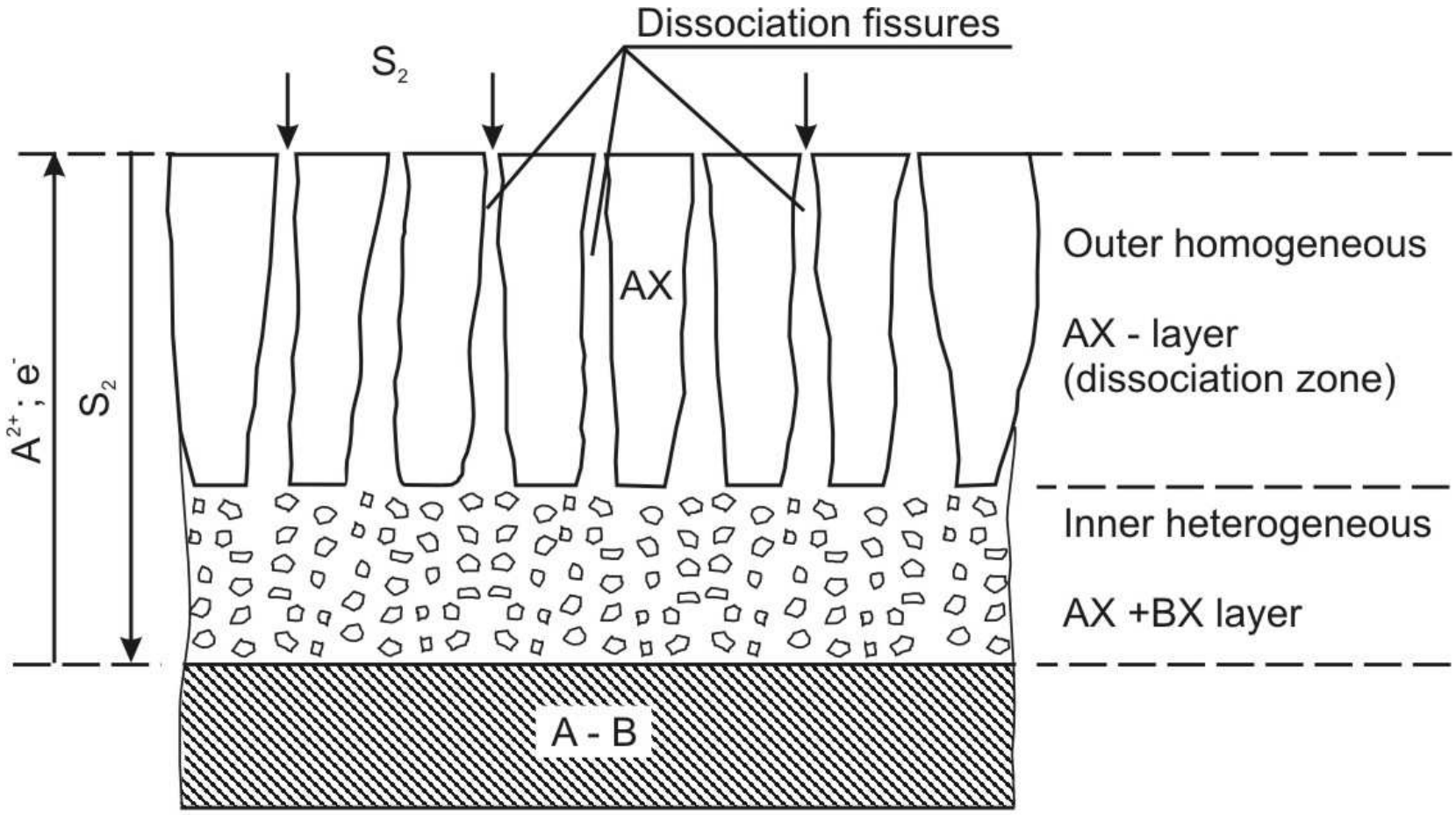




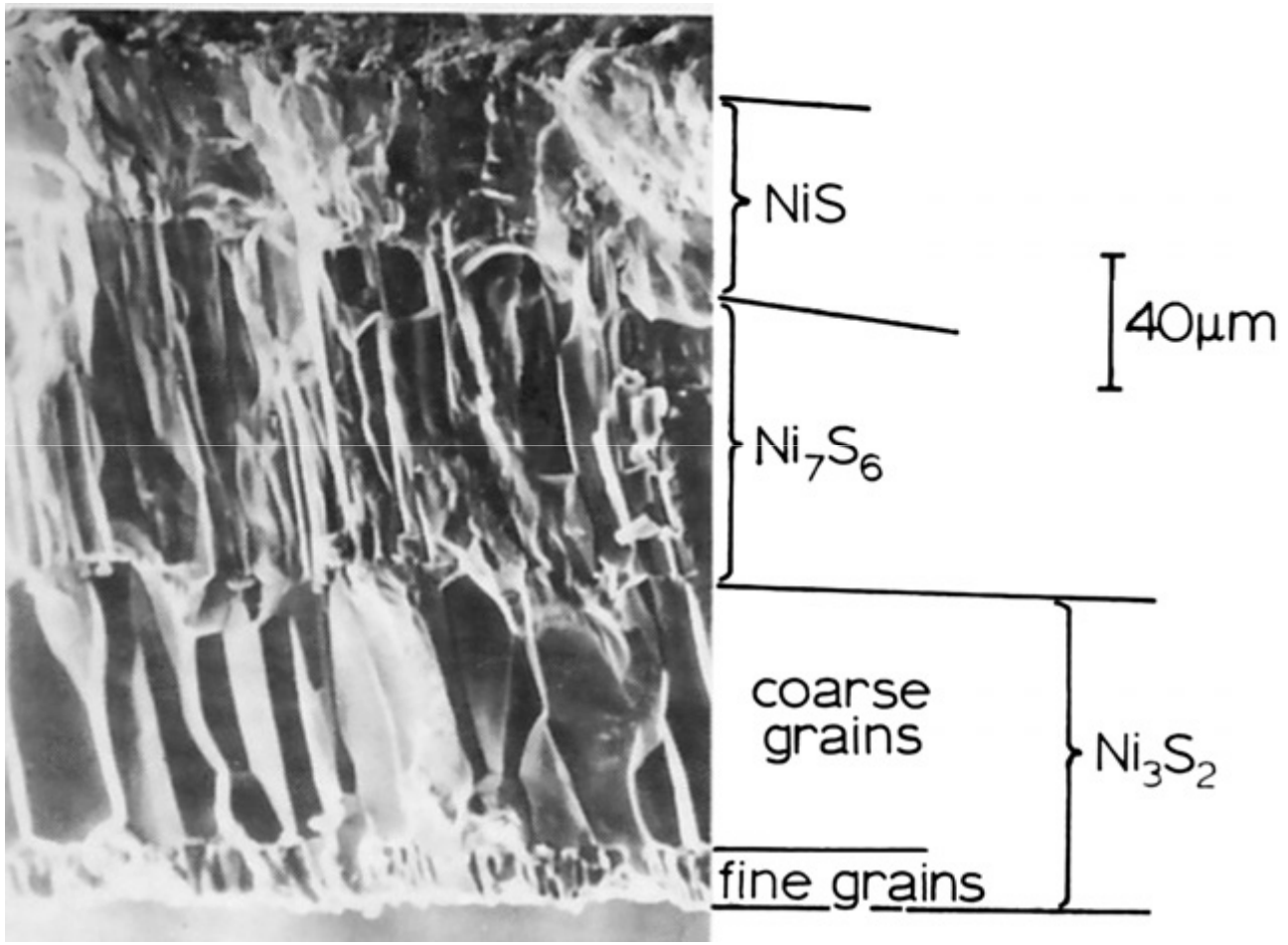
Influence of Cr on the sulphidation and oxidation rate of different metals



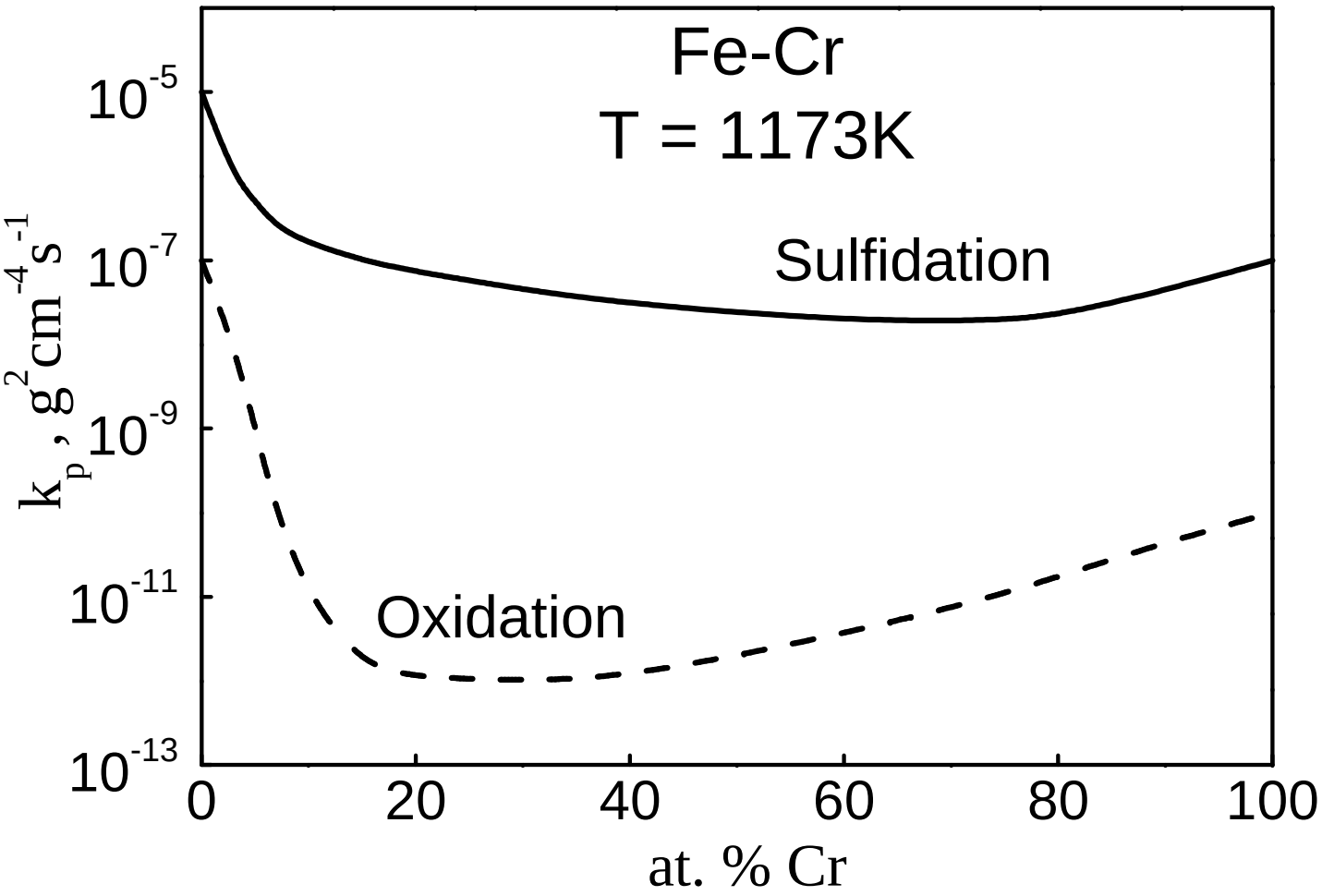
Formation of a triple-layer sulfide scale according to the dissociation mechanism



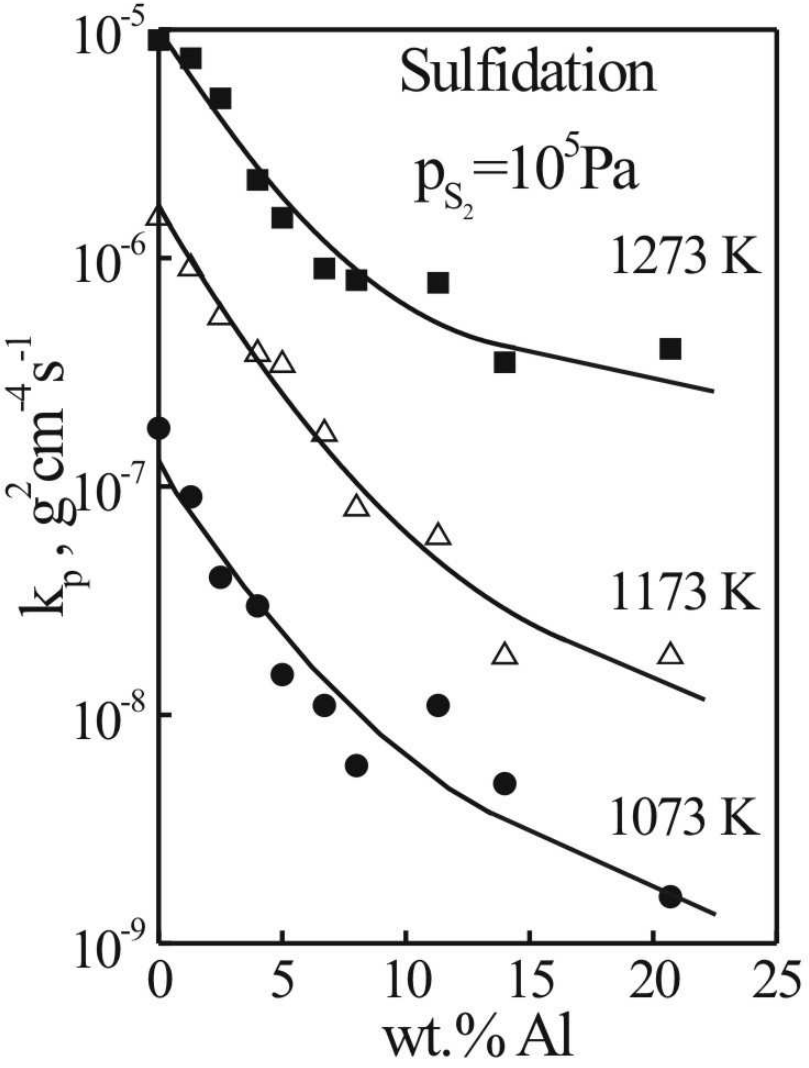
Cross-section of a sulfide scale grown on nickel



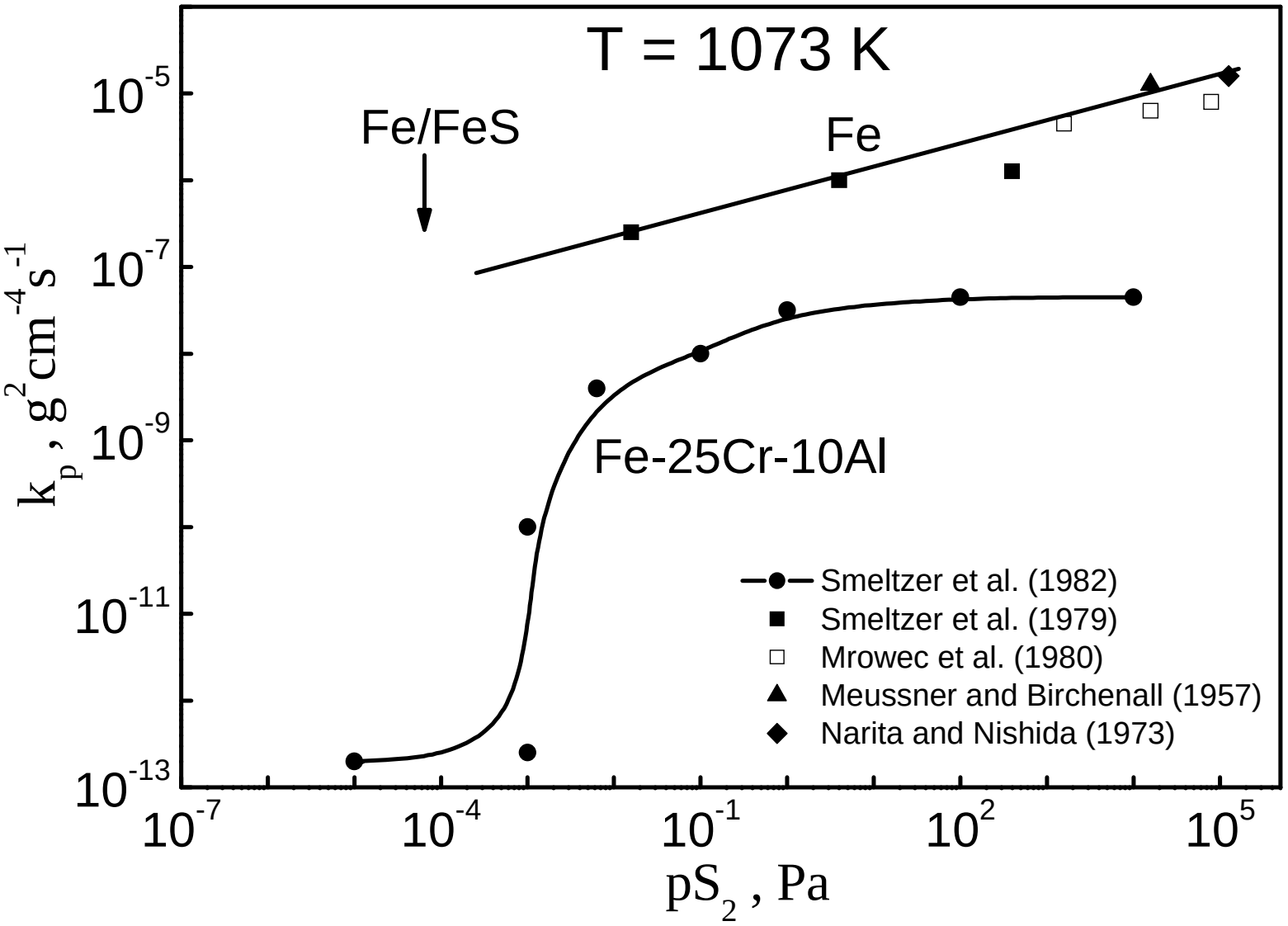
Influence of chromium on the sulfidation and oxidation rate of iron



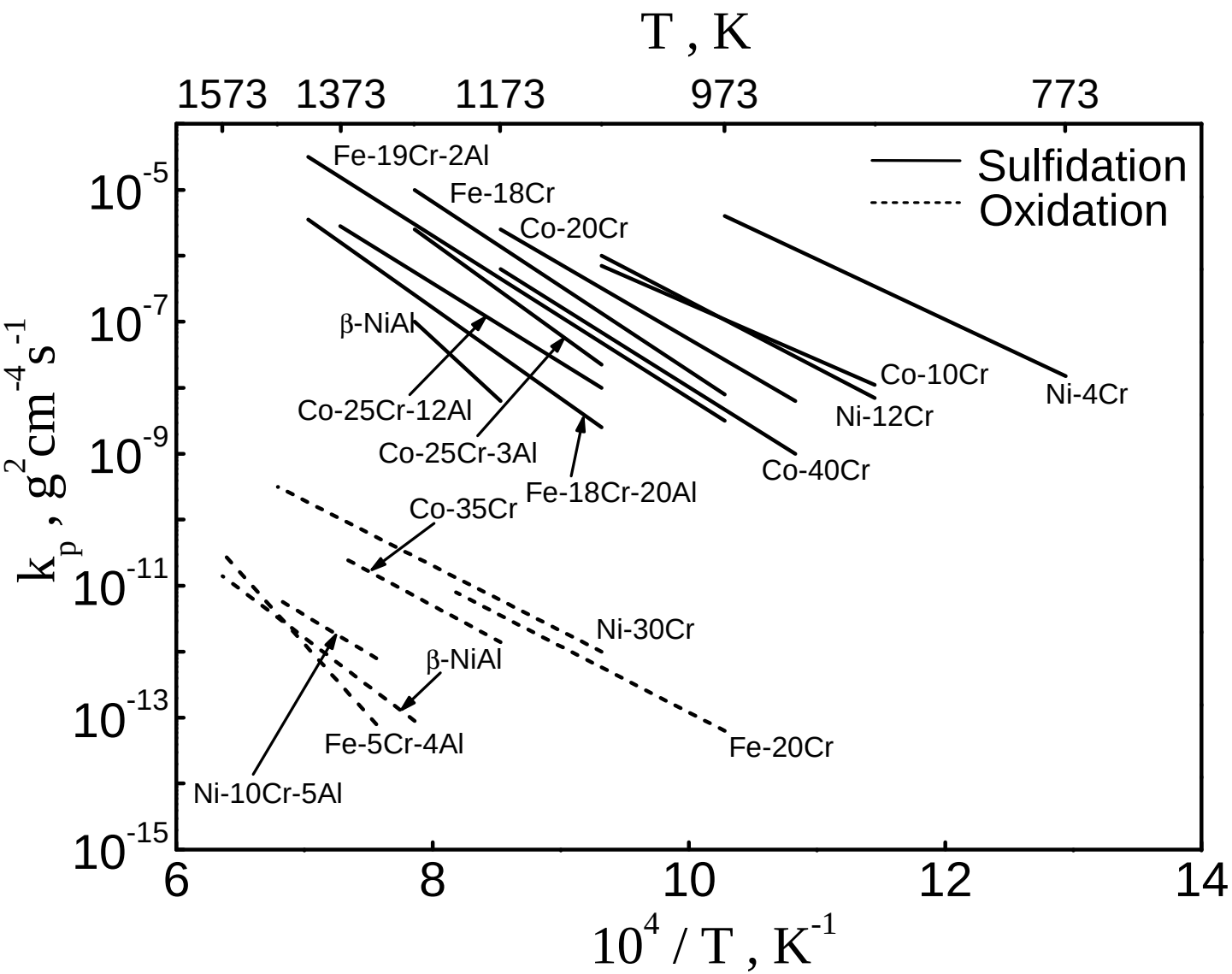
Influence of aluminum on the iron sulfidation rate



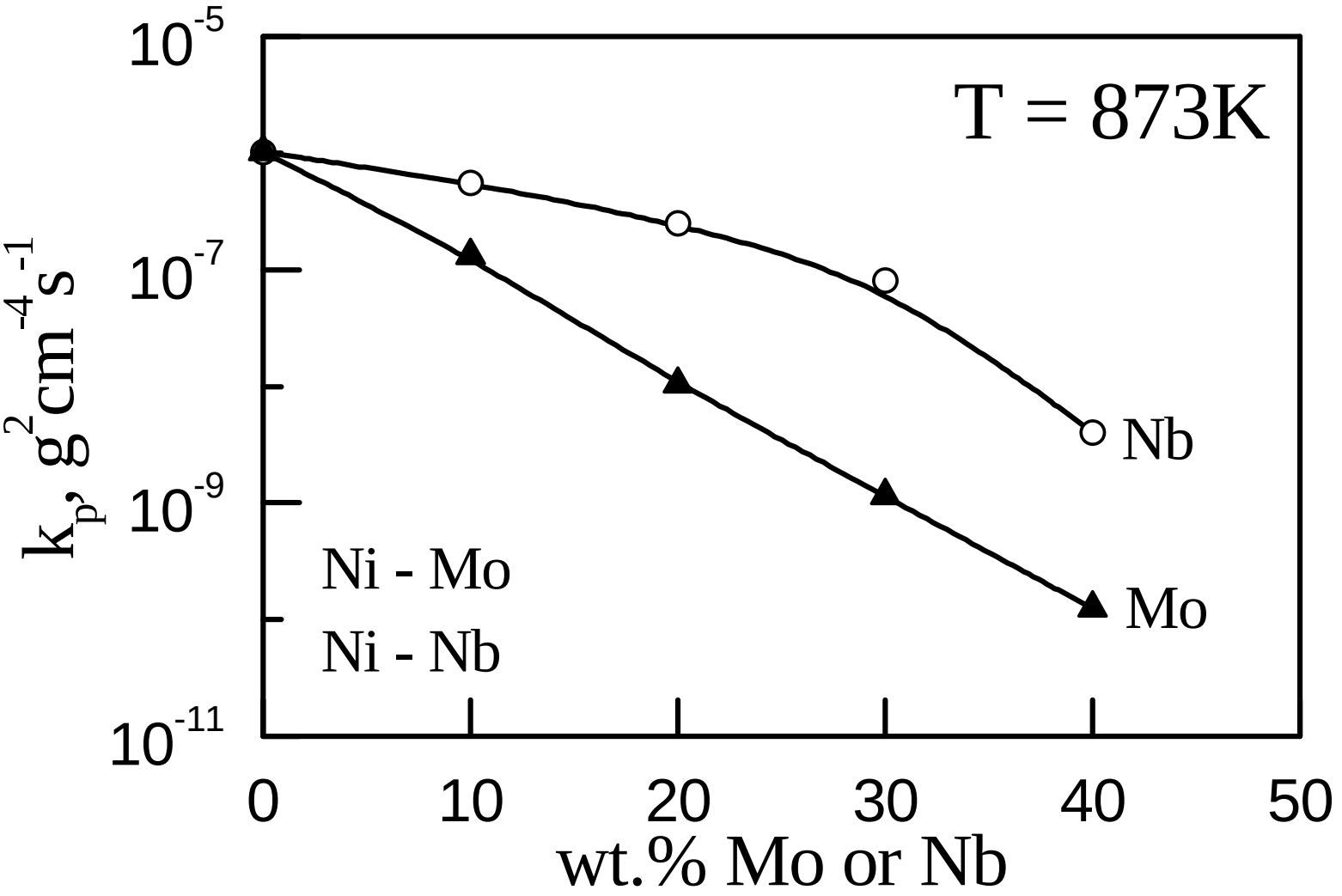
Influence of aluminum on the iron sulfidation rate



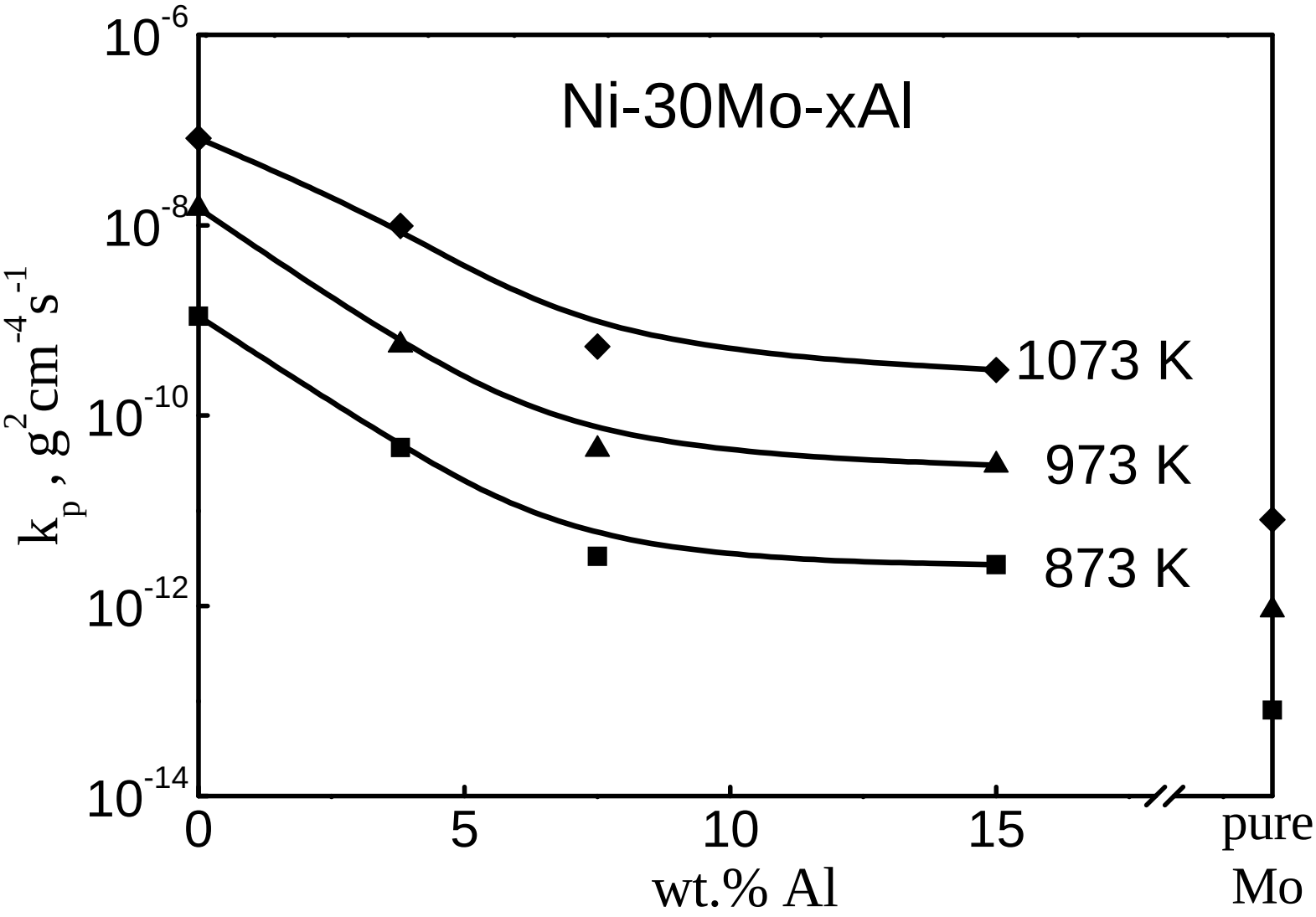
Comparison between sulphidation and oxidation rates of different alloys



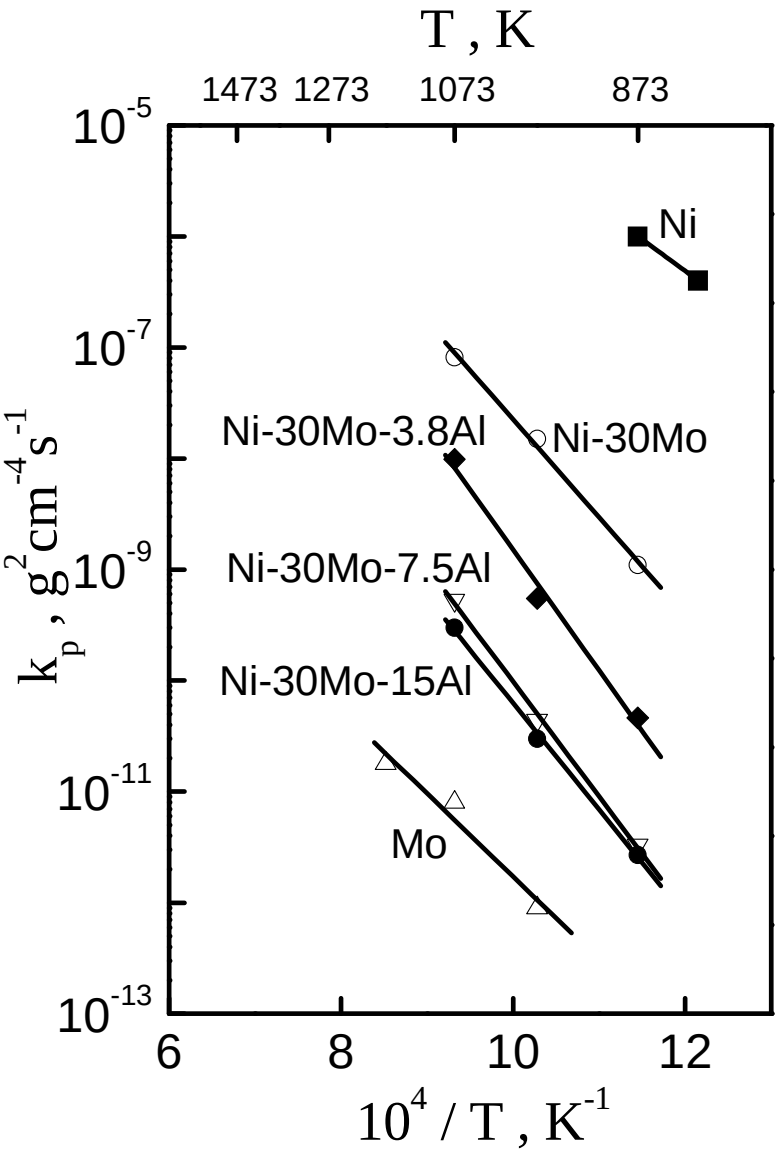
Influence of Mo and Nb on the nickel sulphidation rate



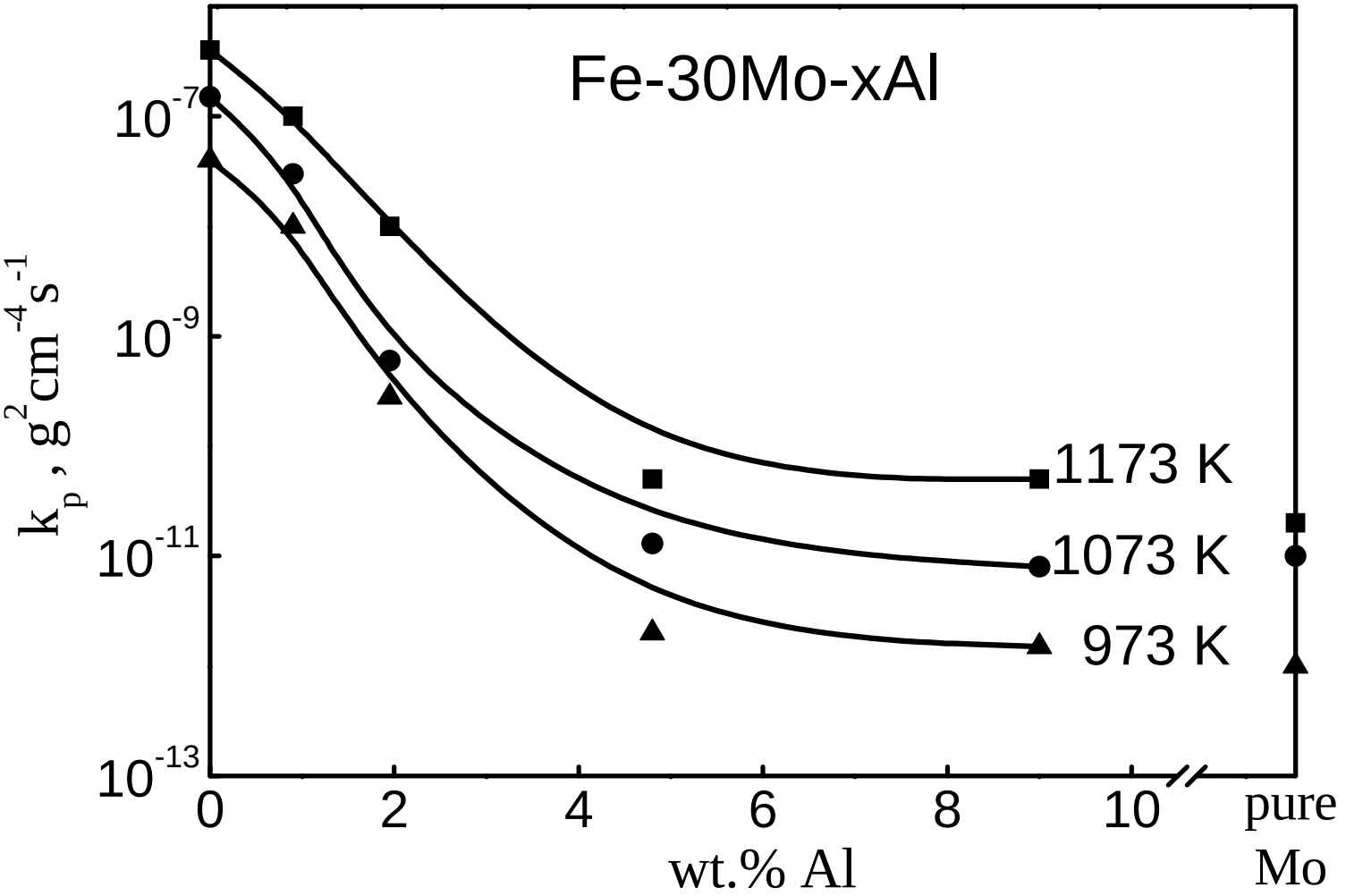
Influence of Al and Mo on the nickel sulphidation rate



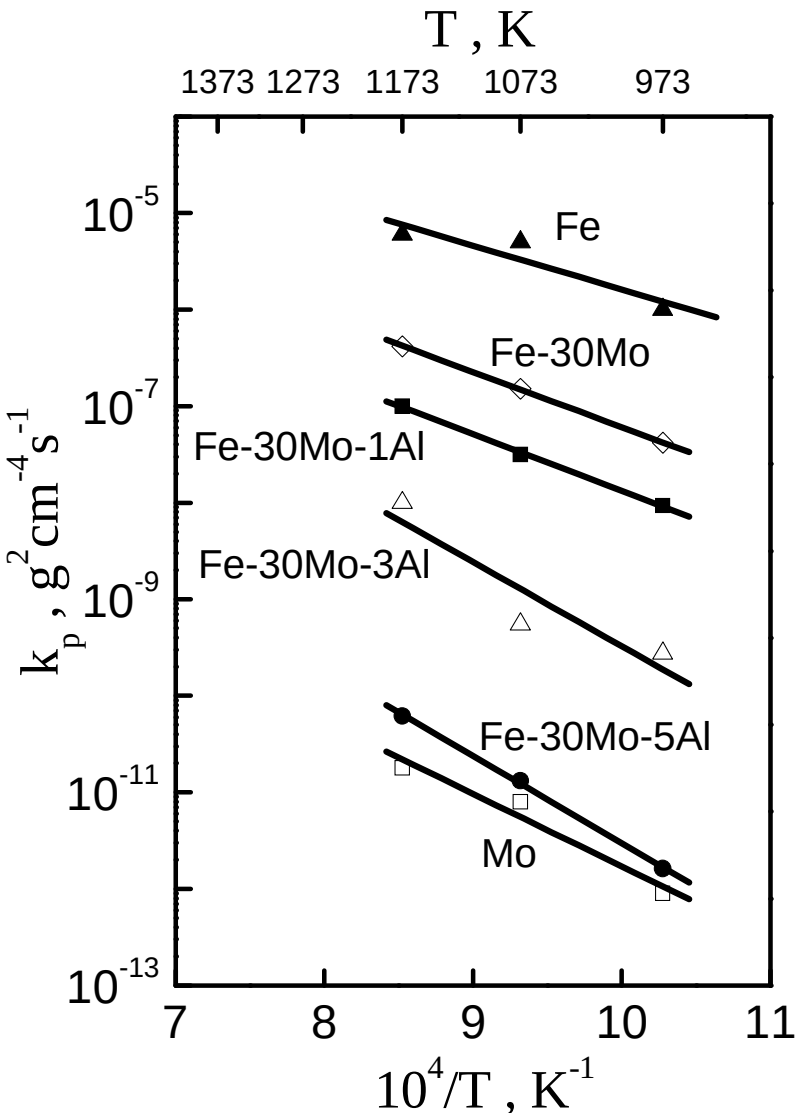
Comparison between sulphidation rates of different Ni alloys with Mo and Al



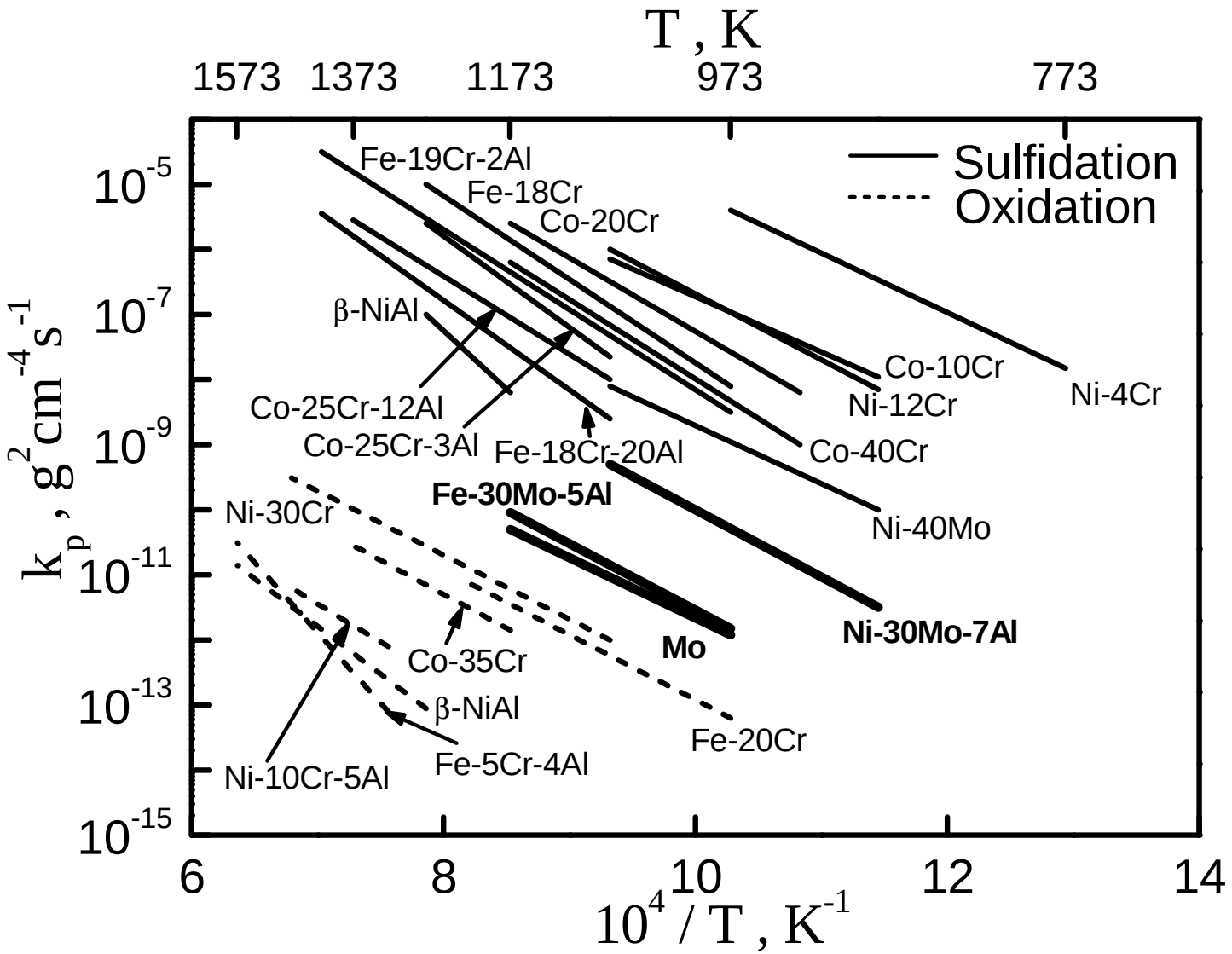
Influence of Al and Mo on the iron sulphidation rate



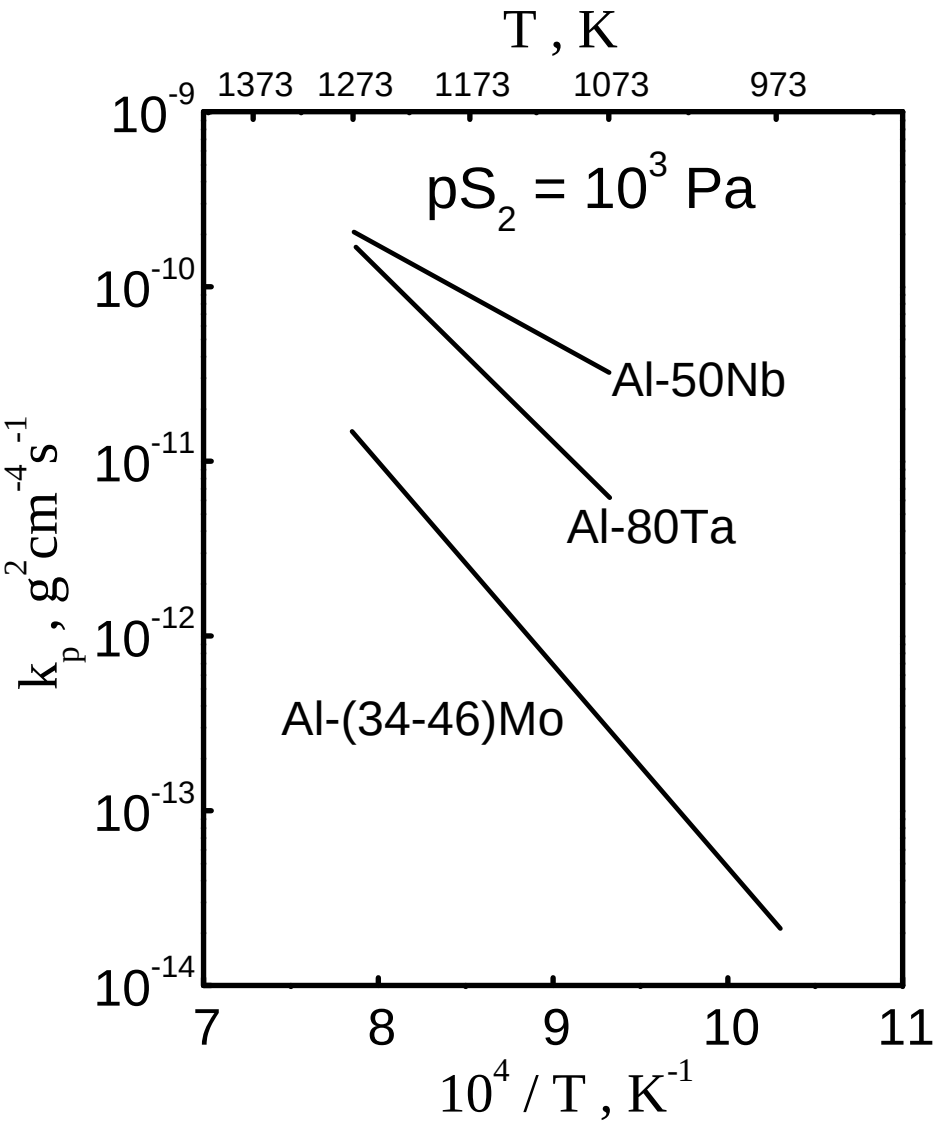
Comparison between sulphidation rates of different Fe alloys with Mo and Al



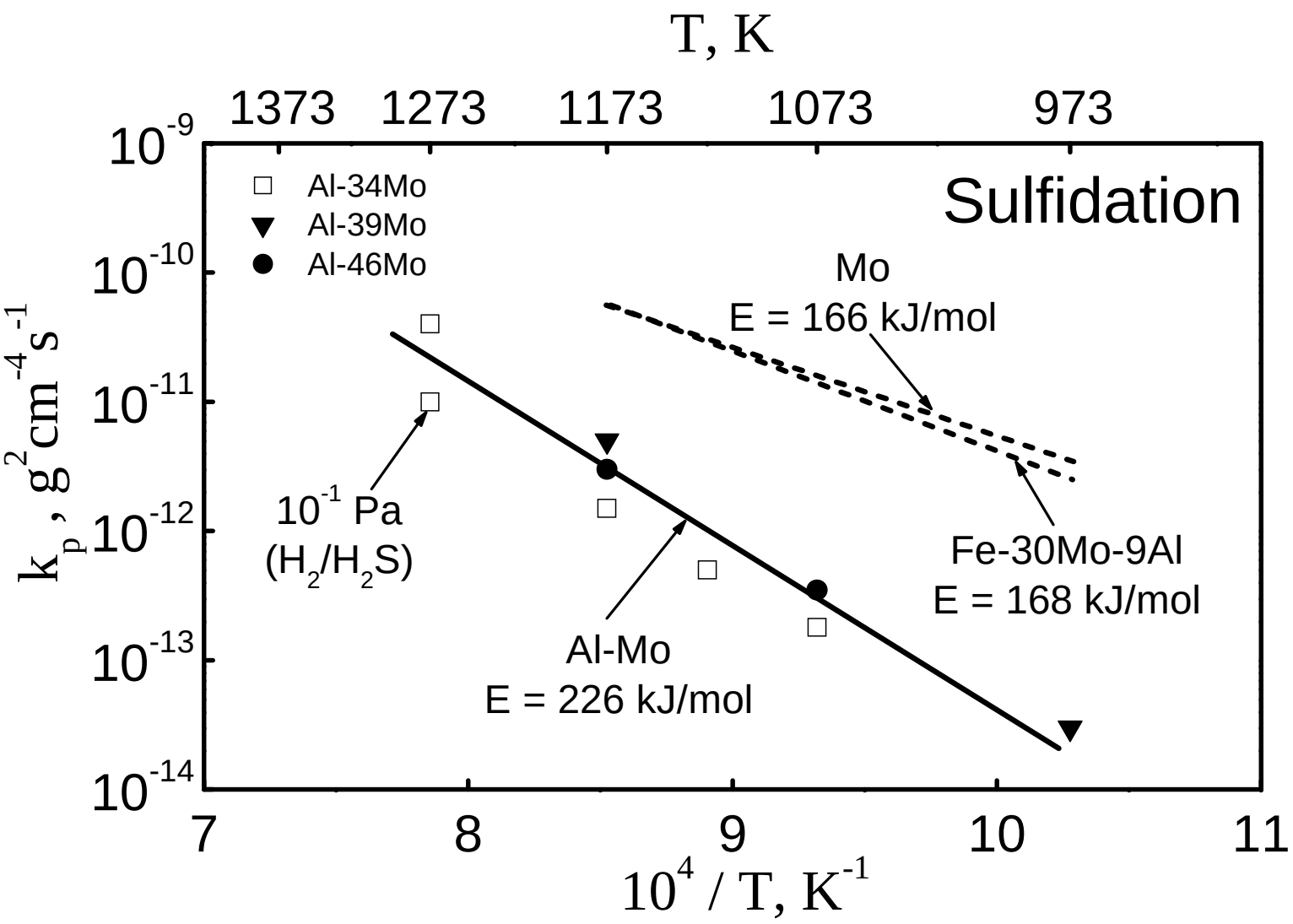
Sulphidation rates of several Ni and Fe alloys with Mo and Al



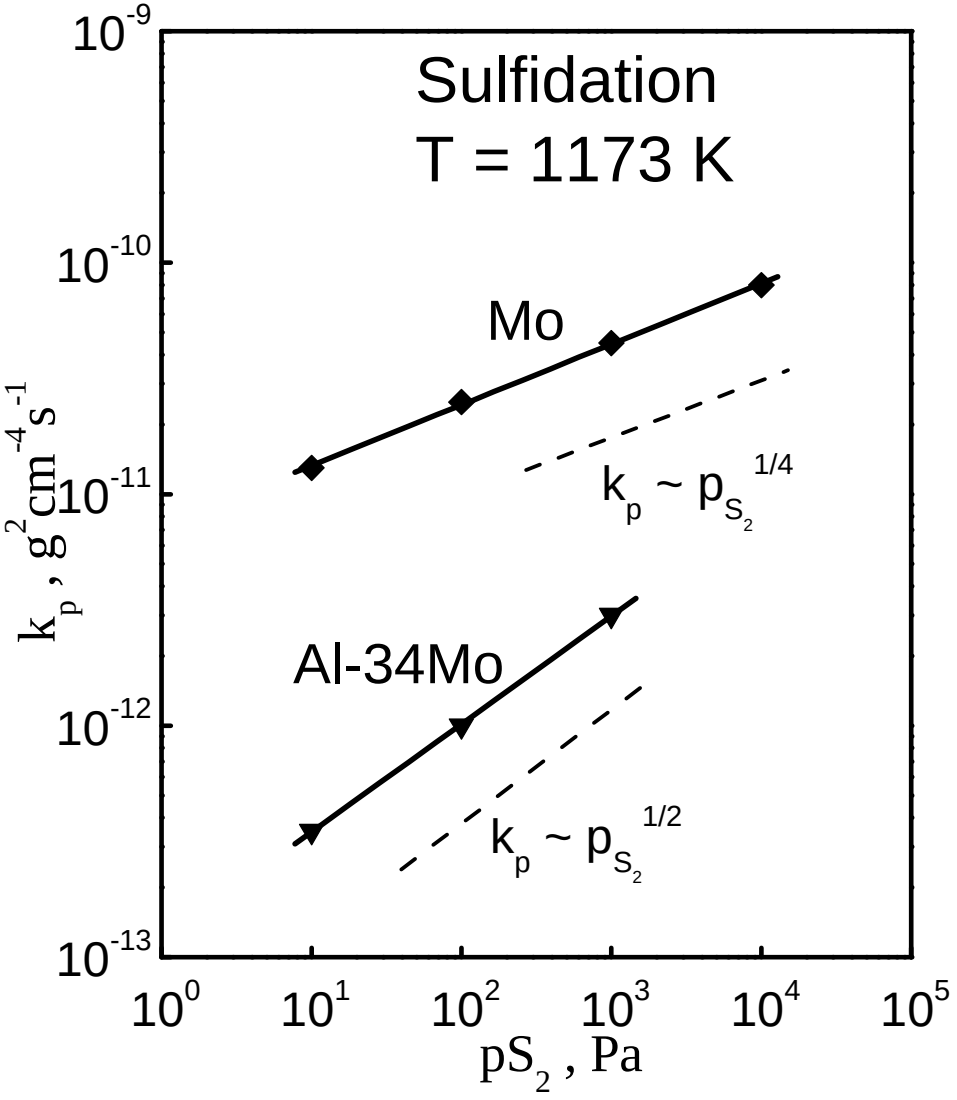
Sulphidation rates of high-melting metal alloys with aluminum



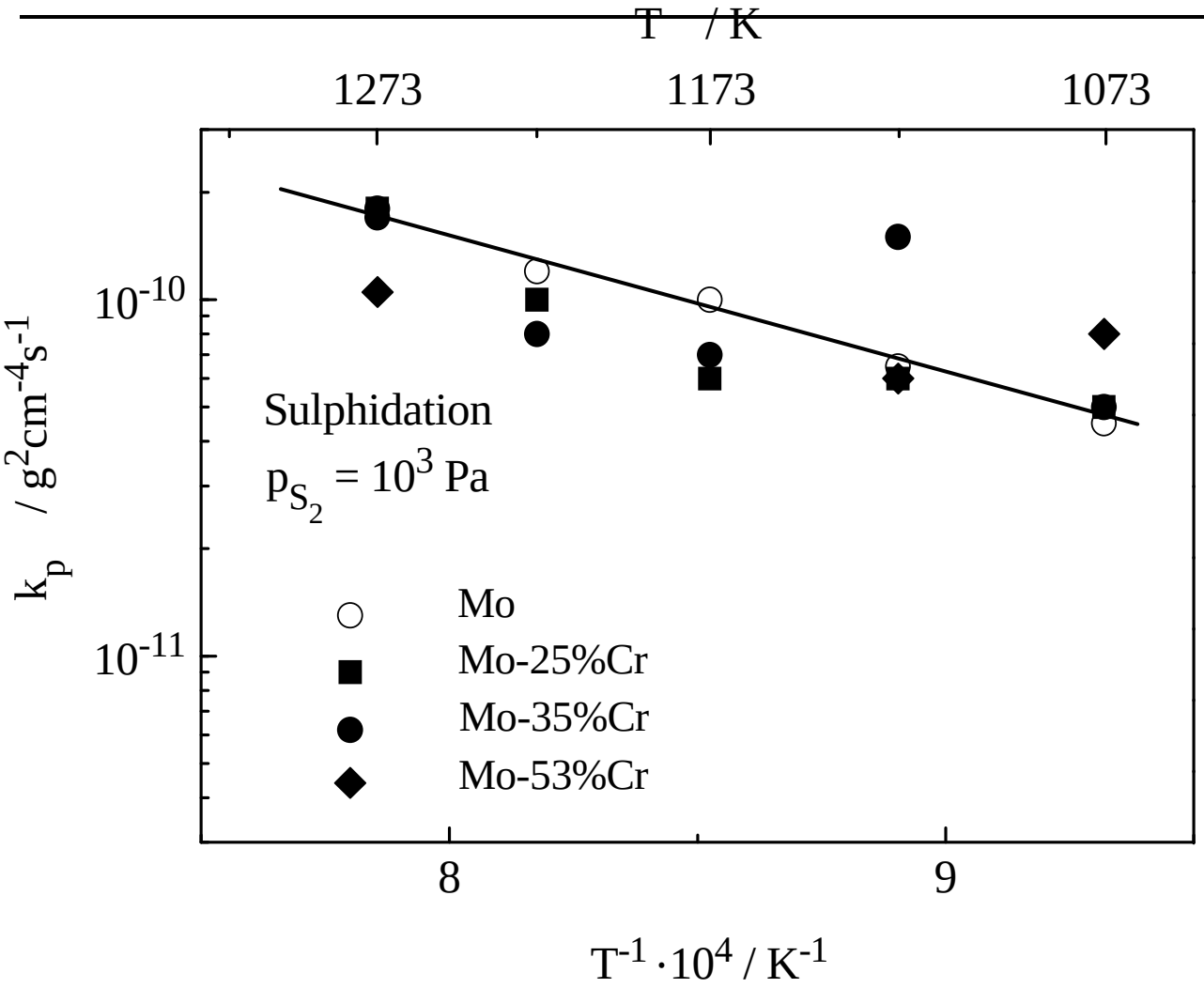
Sulphidation rates of molybdenum alloys with aluminum



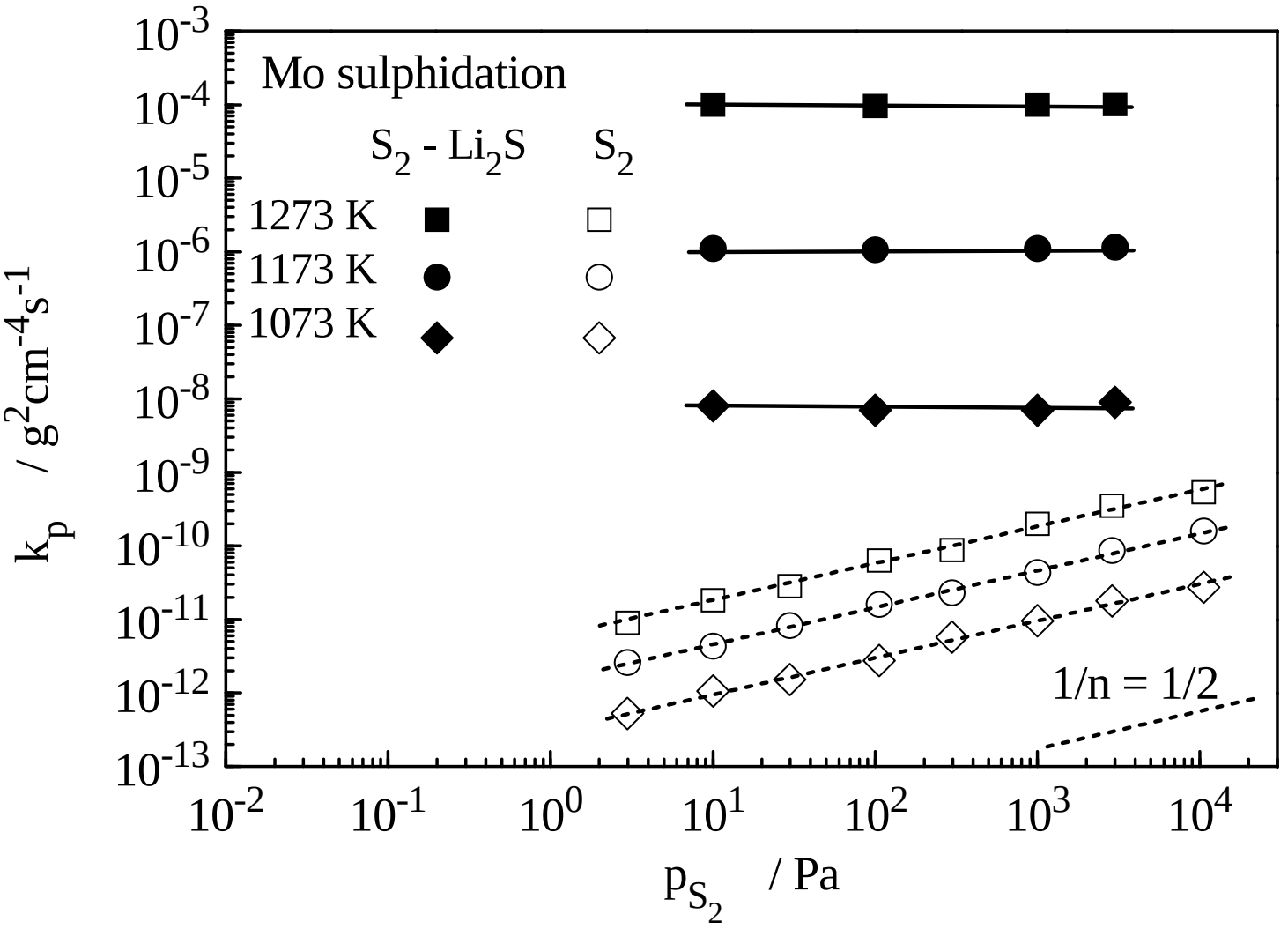
Sulphidation rates of molybdenum alloys with aluminum



Temperature dependence of Mo-Cr sulphidation rates on the background of an analogous dependence obtained for Mo

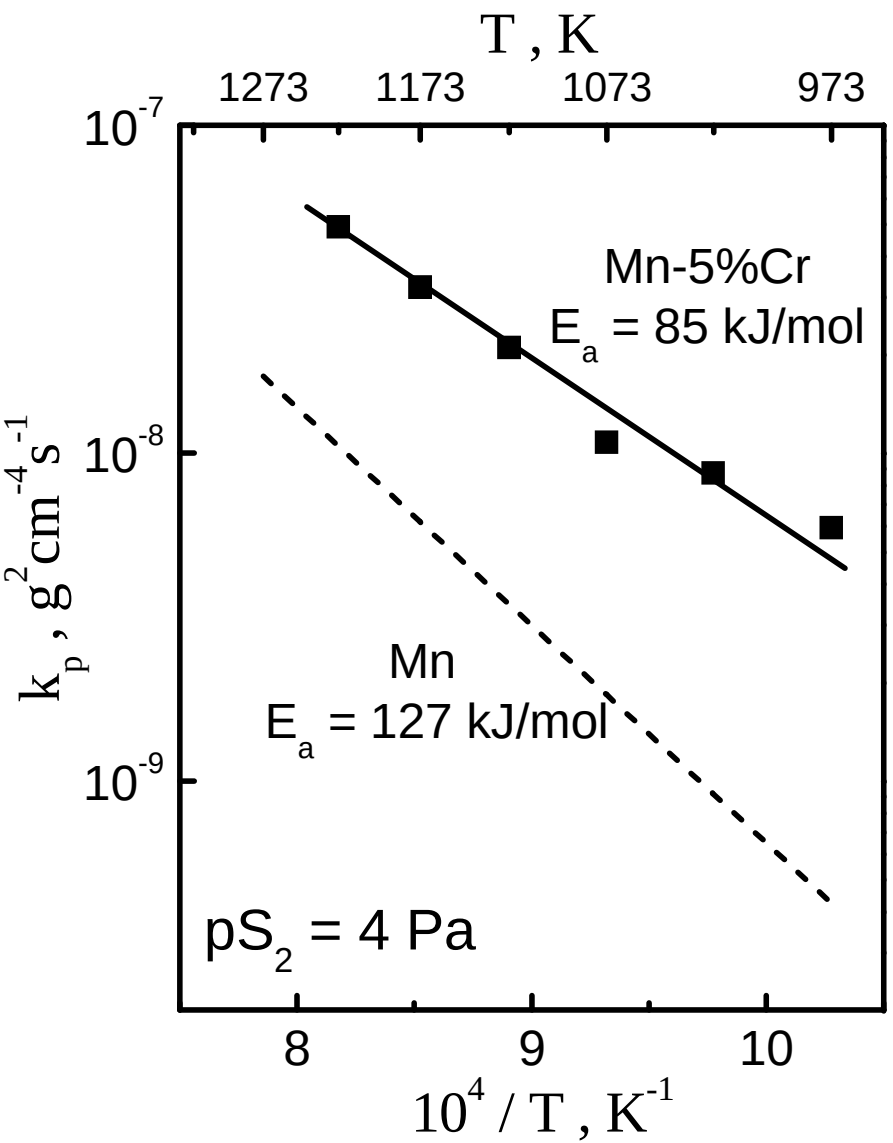


Pressure dependence of the parabolic sulphidation rate constant of Mo in pure and Li_2S-containing sulfur vapors

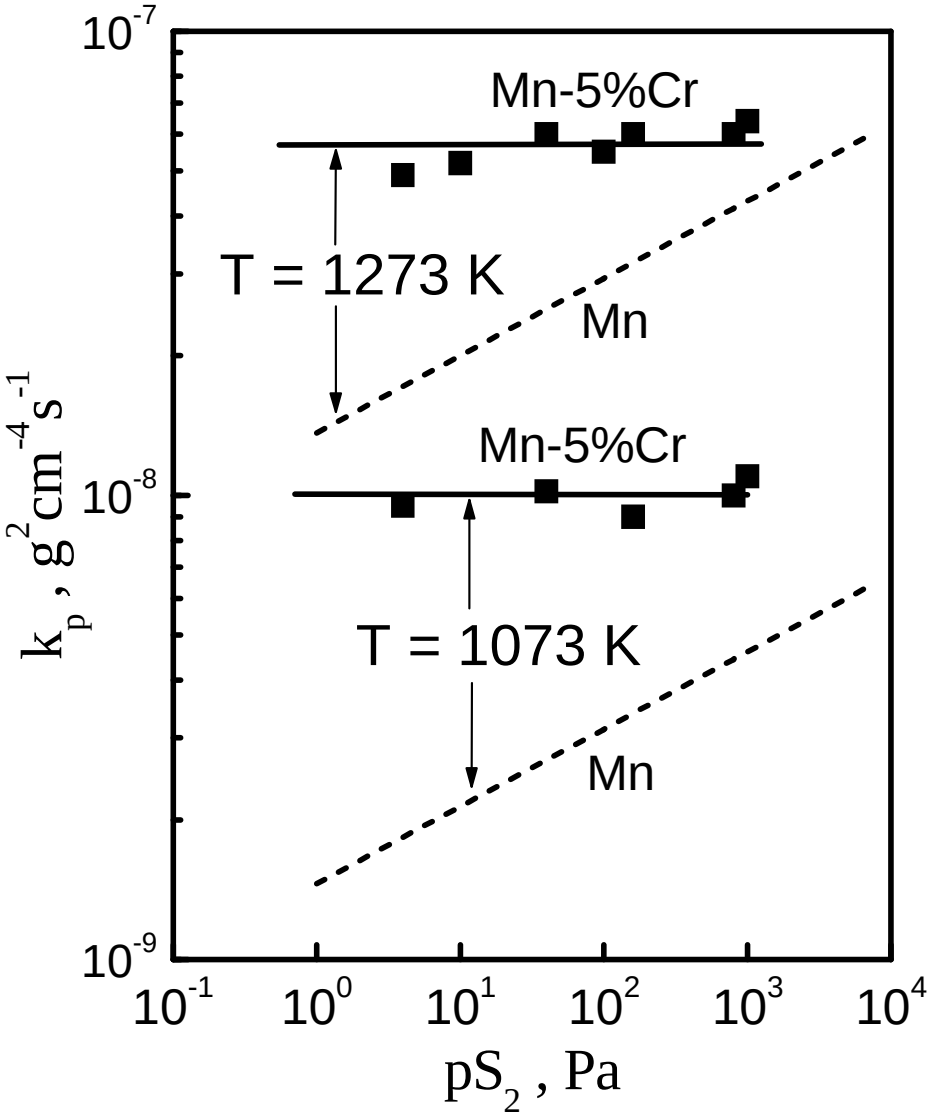


Z. Grzesik, Journal of Solid State Electrochemistry, 13, 1701-1708 (2009)

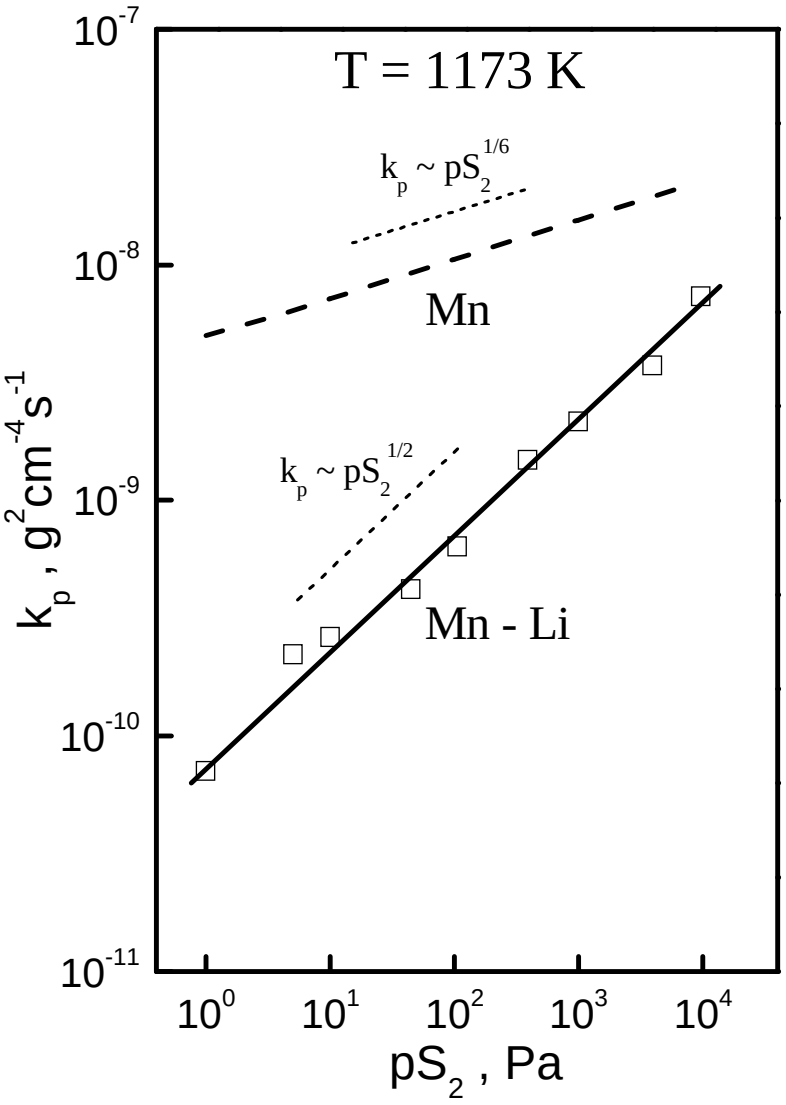
Temperature dependence of the Mn-5%Cr alloy parabolic rate constant



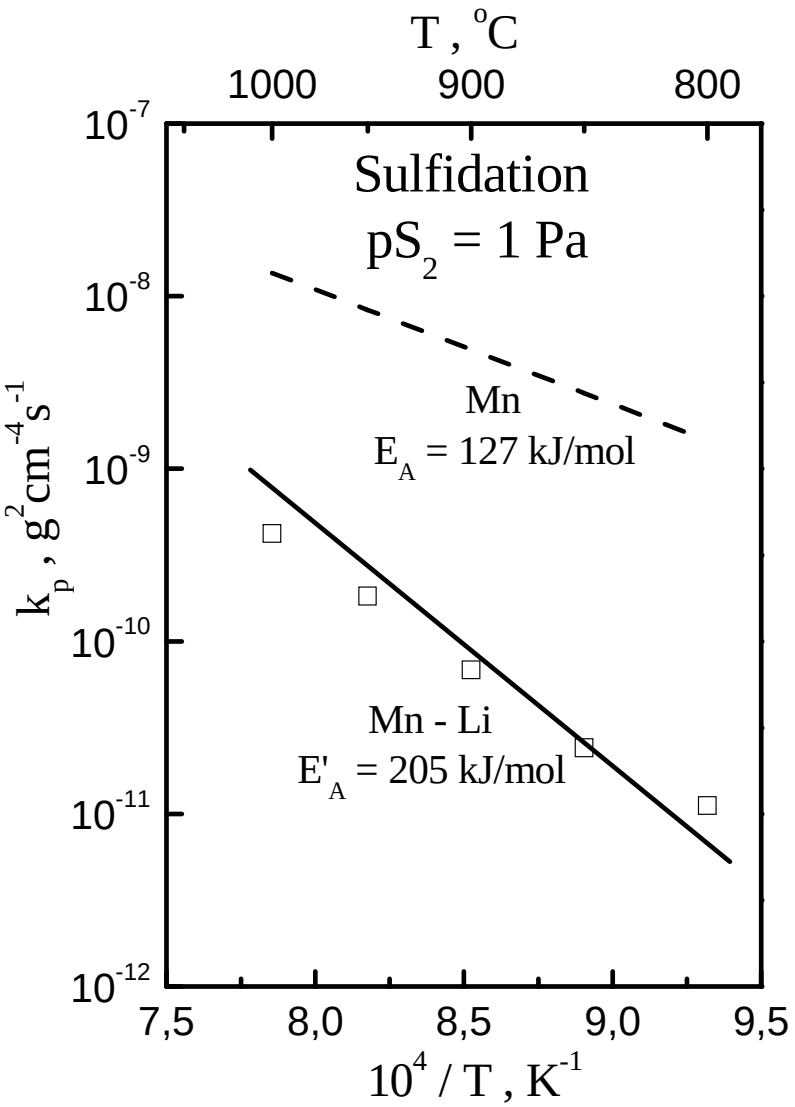
Pressure dependence of the Mn-5%Cr alloy parabolic rate constant



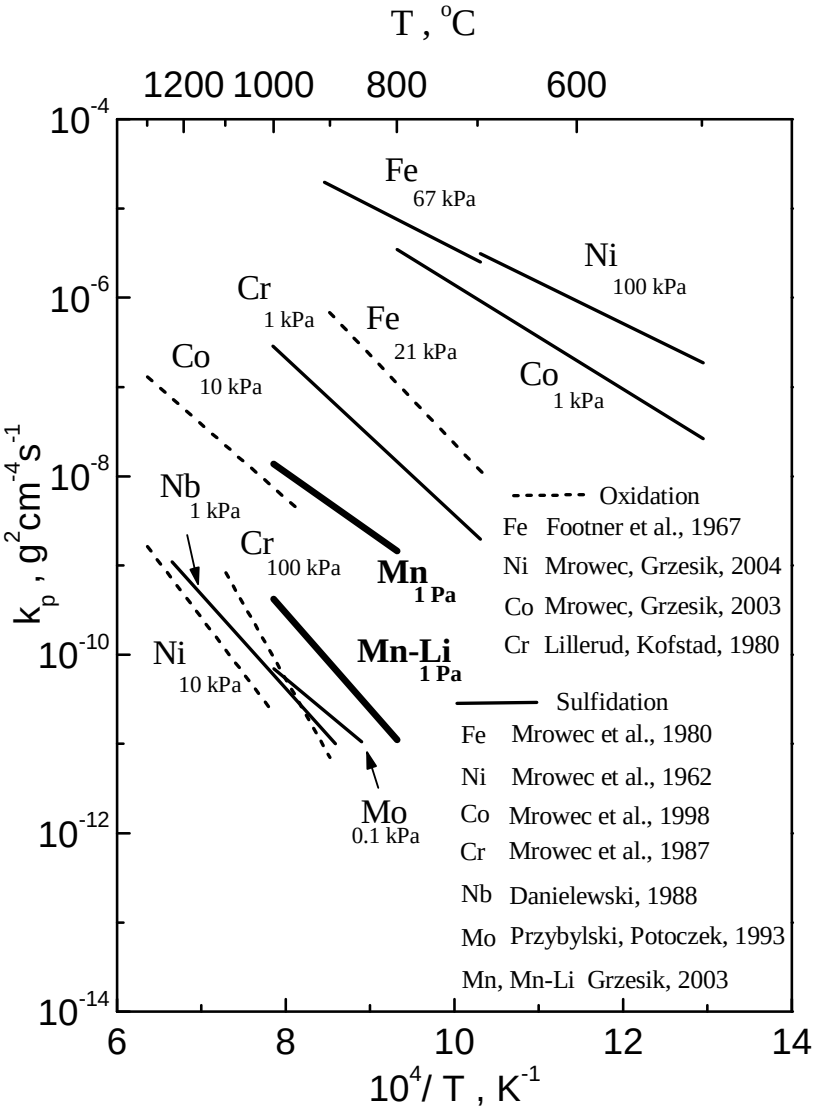
Dependence of k_p on pressure in the case of pure and Li-doped Mn



Dependence of k_p on temperature for pure and lithium-doped manganese



Dependence of k_p on temperature for pure and lithium-doped manganese



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