REVIEW OF LOW-TEMPERATURE OXIDATION OF CARBON STEELS AND LOW-ALLOY STEELS FOR USE AS HIGH-LEVEL RADIOACTIVE WASTE PACKAGE MATERIALS

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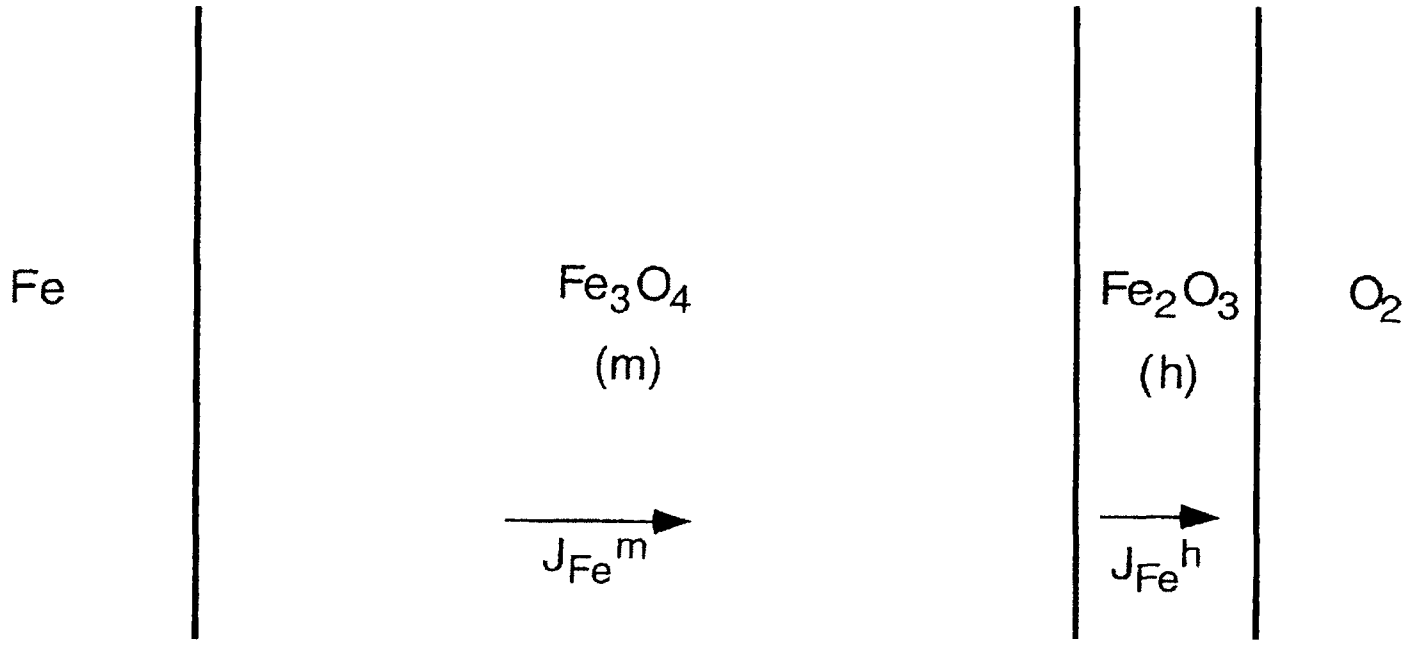

Figure 2-5. Schematic illustration of the cation flux partitioning at the Fe_3O_4/Fe_2O_3 interface during the low temperature oxidation of iron

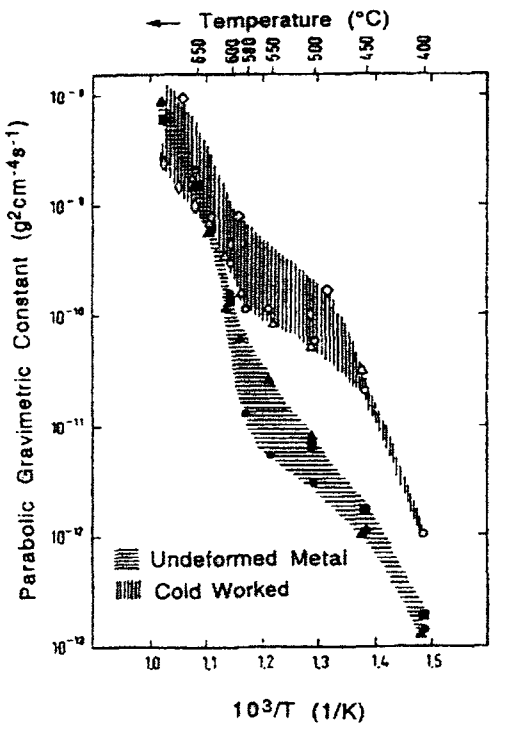

Figure 2-6. Influence of cold work on the oxidation rate of pure iron. The diagram clearly shows that the scaling kinetics of cold worked iron are faster than those of undeformed metal for temperatures below 650 °C. [Caplan and Cohen (1966), reprinted with permission from Elsevier Science Ltd.]

Temperature (°C)	Δm/A (mg/cm^2)	X (μm)	R (μm)
300	3.66	25.2	12
275	1.60	11.0	5.2
250	0.65	4.5	2.1
225	0.239	1.6	0.78
200	0.080	0.55	0.26
175	0.0234	0.16	0.077
150	0.0059	0.041	0.019
125	0.00127	0.0088	0.0042
100	0.00022	0.0015	0.0007

Table 4-3. Mass gain (Δm/A), thickness of the oxide scale (X), and recession thickness (R) calculated for a period of 1,000 years of oxidation in dry oxygen for Fe-2.25Cr-1Mo

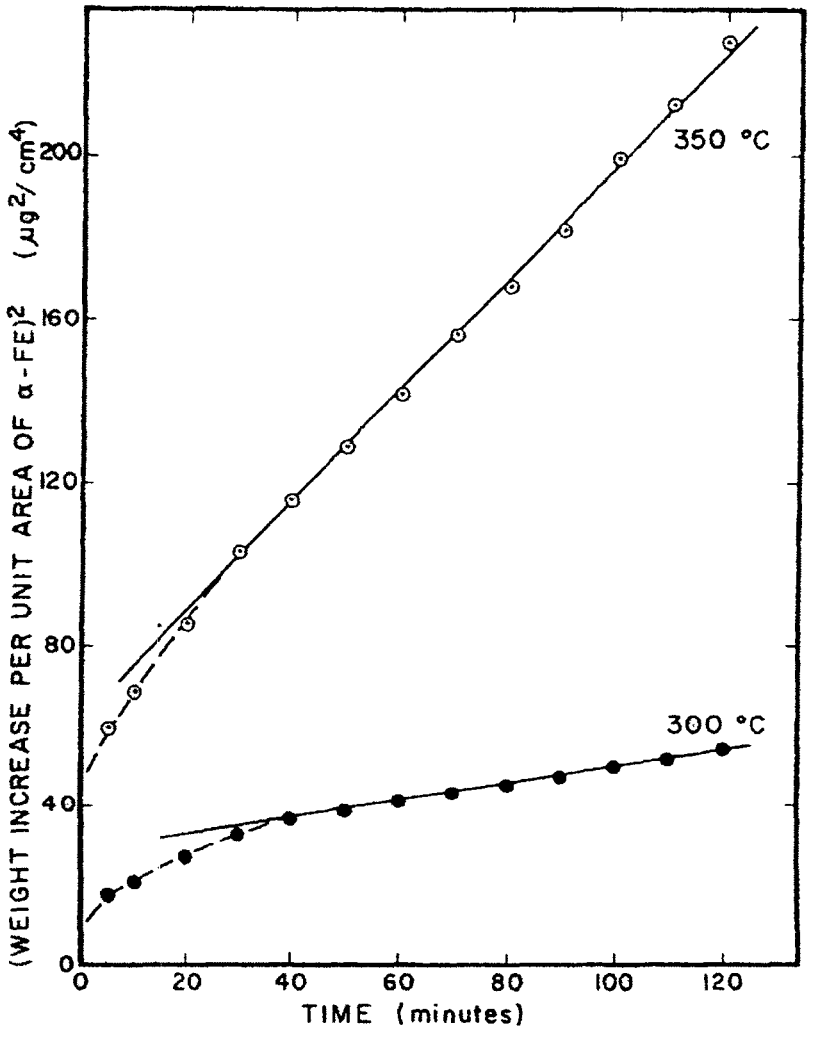

Figure 3-12. Parabolic plot of oxidation of pearlitic carbon steels containing 0.8 wt% carbon oxidized at 300 and 350 °C under an oxygen partial pressure of 0.13 atm [Runk and Kim (1970), reprinted with permission from Plenum Publishing Corporation]

Temperature (°C)	Δm/A (mg/cm²)	X (μm)	R (μm)
300	7.2 (4.1)	50 (29)	24 (14)
275	4.1 (2.4)	28 (16)	13 (7)
250	2.2 (1.3)	15 (9)	7.2 (4.1)
225	1.1 (0.6)	7.6 (4.4)	3.6 (2.1)
200	0.52 (0.30)	3.6 (2.1)	1.7 (1.0)

Table 3-6. Mass gain (Δm/A), thickness of the oxide scale (X), and recession thickness for Fe-0.8 wt% C with fine pearlite for a period of 1,000 years in 0.13 atm of dry oxygen. Values in parentheses correspond to Fe-0.2 wt% C alloy.