Serie 2 Problema 10

Realizar el diagrama E-pH a para el sistema Fe-agua 25°C. Indicar las zonas de corrosiòn, pasivaciòn e inmunidad.

(1) $Fe = Fe^{2+} + 2e^-$

(2) $Fe + H_2O = Fe(OH)_2 + 2H^+ + 2e^-$

(3) $Fe + H_2O = HFeO_2^- + 3H^+ + 2e^-$

(4) $Fe^{2+} + 2H_2O = Fe(OH)_2 + 2H^+$

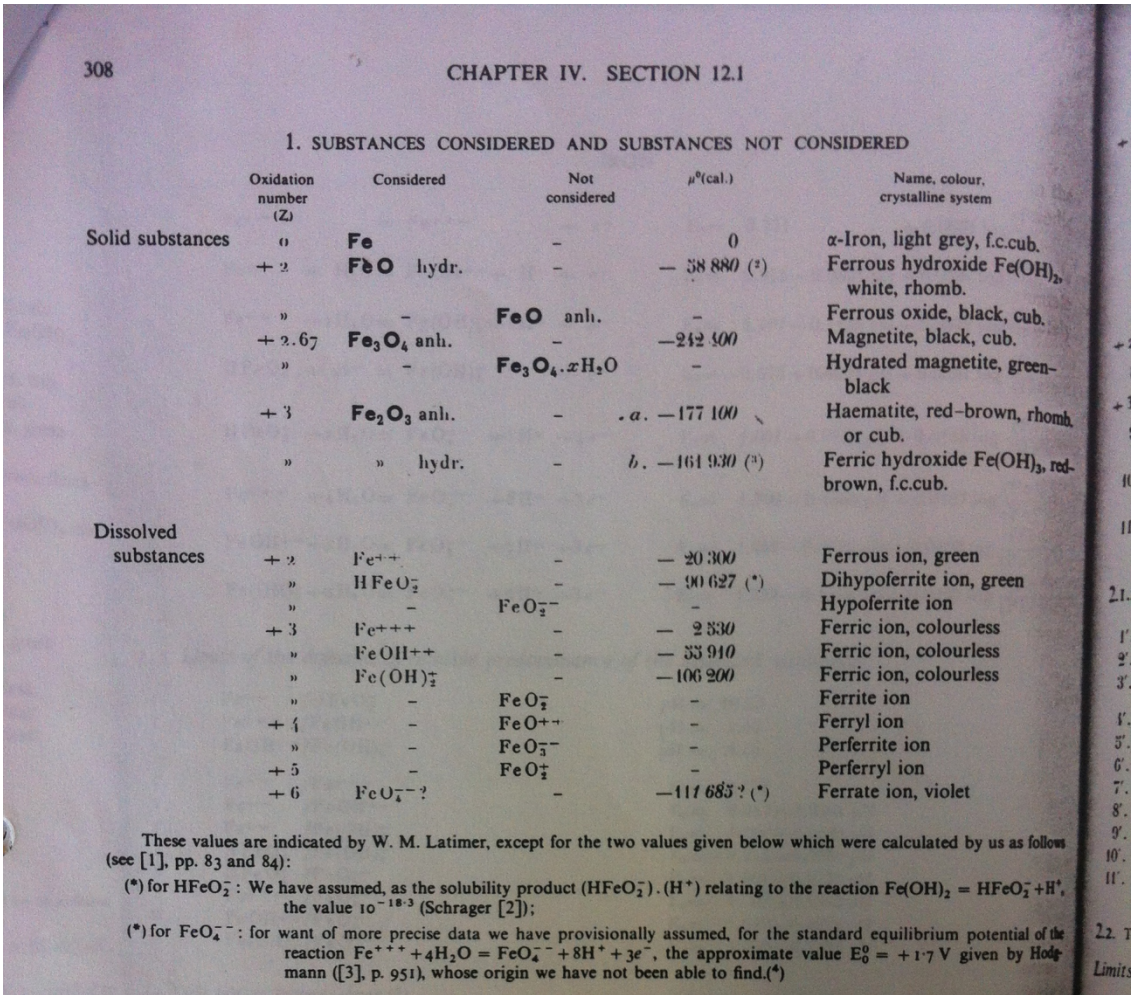
(5) $Fe(OH)_2 = HFeO_2^- + H^+$

(6) $Fe^{2+} + 3H_2O = Fe(OH)_3 + 3H^+ + e^-$

(7) $Fe^{3+} + 3H_2O = Fe(OH)_3 + 3H^+$

(8) $HFeO_2^- + H_2O = Fe(OH)_3 + 2e^-$

(9) $Fe(OH)_2 + H_2O = Fe(OH)_3 + H^+ + e^-$



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1. SUBSTANCES CONSIDERED AND SUBSTANCES NOT CONSIDERED

	Oxidation number (Z)	Considered	Not considered	μ^0(cal.)	Name, colour, crystalline system
Solid substances	0	Fe	–	0	α-Iron, light grey, f.c.cub.
	+2	FeO hydr.	–	−58 880 (2)	Ferrous hydroxide $Fe(OH)_2$, white, rhomb.
	»	–	FeO anh.	–	Ferrous oxide, black, cub.
	+2.67	Fe_3O_4 anh.	–	−242 400	Magnetite, black, cub.
	»	–	$Fe_3O_4.xH_2O$	–	Hydrated magnetite, green-black
	+3	Fe_2O_3 anh.	–	a. −177 100	Haematite, red-brown, rhomb. or cub.
	»	» hydr.	–	b. −161 930 (3)	Ferric hydroxide $Fe(OH)_3$, red-brown, f.c.cub.
Dissolved substances	+2	Fe^{++}	–	−20 300	Ferrous ion, green
	»	$HFeO_2^-$	–	−90 627 (*)	Dihypoferrite ion, green
	»	–	FeO_2^{--}	–	Hypoferrite ion
	+3	Fe^{+++}	–	−2 530	Ferric ion, colourless
	»	$FeOH^{++}$	–	−55 910	Ferric ion, colourless
	»	$Fe(OH)_2^+$	–	−106 200	Ferric ion, colourless
	»	–	FeO_2^-	–	Ferrite ion
	+4	–	FeO^{++}	–	Ferryl ion
	»	–	FeO_3^{--}	–	Perferrite ion
	+5	–	FeO_2^+	–	Perferryl ion
	+6	FeO_4^{--} ?	–	−117 685 ? (*)	Ferrate ion, violet

These values are indicated by W. M. Latimer, except for the two values given below which were calculated by us as follows (see [1], pp. 83 and 84):

(*) for $HFeO_2^-$: We have assumed, as the solubility product $(HFeO_2^-).(H^+)$ relating to the reaction $Fe(OH)_2 = HFeO_2^- + H^+$, the value $10^{-18.3}$ (Schrager [2]);

(*) for FeO_4^{--}: for want of more precise data we have provisionally assumed, for the standard equilibrium potential of the reaction $Fe^{+++} + 4H_2O = FeO_4^{--} + 8H^+ + 3e^-$, the approximate value $E_0^0 = +1.7$ V given by Hodgmann ([3], p. 951), whose origin we have not been able to find.(4)