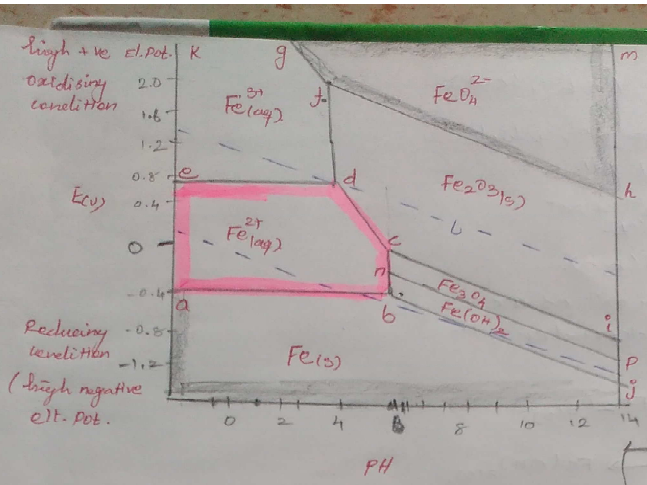

Pourbaix Diagram [Elect. pot Vs pH]

It is graphi. reptes. of the thermodynamic eq states of a metal-electrode syst.

In which the lines of the diagram dividing different zones of the eq-states are calc. by "Nerst equation"

$$E = E^0 - \left(\frac{0.0591}{n}\right) \log C_{ion}$$

E^0 → Std. electrode pot; n → no. of e's transferred; C_{ion} → molar activity of ion.

Dotted line says the theoritical stability of the water.

$$2H_2O \longrightarrow 4H^+ + 4e^- + O_2$$

Above line water is oxidised to oxygen.

Below the dotted line water is reduced

$$2H^+ + 2e^- \longrightarrow H_2.$$

Solid iron zone (below a-b-j) (Immunity zone)

The electrochemical reaction proceed in the direction of red of iron ions.

No corrosion in this zone.

Fe^{2+} zone (a-b, c-d-e) (corrosion zone).

- Aqueous soln of ion (Fe^{2+}).

→ Metallic ion oxidizes in this zone)

Fe^{3+} zone (e-d-f-g-k) corrosion zone

→ Aq. soln of Fe^{3+}

→ Metallic ion oxidize in this zone (Iron corrodes)

Fe_2O_3 (solid) (c-d-f-h-i) passivation zone

→ Solid ferrous oxide

→ Iron corrode but the oxide film reduce the corrosion bez of passivation.

Fe_3O_4 (solid oxide) (n-c-i-p) ($Fe_2O_3 \cdot FeO$).

→ Iron oxide film causes passivation.

$Fe(OH)_2$ (b-n-p-j). (Green rust). passivation zone.

→ Green rust is unstable. corrosion pdt to produce low oxygen envi

Horizontal lines: (a-b), (e-d).

→ Represent, redox rxn, which are independent of pH.

(redox rxn) $Fe_{(s)} \longrightarrow Fe^{2+}_{(aq)} + 2e^-$

vertical lines: (d-f) (b-n).

Represents non redox rxn. e⁻s are not involved which depend on pH.

(acid base rxn)

$2Fe^{3+}_{(aq)} \xrightarrow{3O^{2-}} Fe_2O_{3(s)}$.

$Fe^{2+} + 2OH^- \longrightarrow Fe(OH)_{2(s)}$.

diagonal lines (~~e-d~~) (e-d), (b-j)

Represent the redox rxn which depends on pH (acid-base rxn)

(e-d) $2Fe^{2+}_{(aq)} + 3H_2O \longrightarrow Fe_2O_{3(s)} + 6H^+_{(aq)} + 2e^-$

(b-j) $Fe_{(s)} + 2OH^-_{(aq)} \longrightarrow Fe(OH)_{2(s)} + 2e^-$