# REDOX INDICATOR

**Dr. Monojit Ray**
**Principal**
**Barrackpore Rastraguru Surendranath College**

**An oxidation-reduction indicator (redox indicator) is a compound which**

**exhibits different colours in the oxidised and reduced forms:**

$$In(ox) + ne = In(Red)$$

**The oxidation and reduction should be reversible. At a potential *E the ratio of* the concentrations of the two forms is given by the Nernst equation:**

$$E = E^{\circ} + (0.0591/n) \log [Inox]/[Inred]$$

**where *E° is the standard (strictly the formal) potential of the indicator. If the***

**colour intensities of the two forms are comparable a practical estimate of the colour-change interval corresponds to the change in the ratio [Inox]/[InRed] from 10 to 1/10, this leads to an interval of potential of:**

$$E = E^{\circ}_{In} \pm (0.0591/1) \text{ at } 25^{\circ}C$$

**If the colour intensities of the two forms differ considerably the intermediate colour is attained at potential somewhat removed from *E°, but the error is* unlikely to exceed 0.06 volt. For a sharp colour change at the end point, *E°* should differ by about at least 0.15 volt from the standard (formal) potentials of the other systems involved in the reaction.**

- **One of the best oxidation-reduction indicators is the 1,1O-phenanthrolineiron(II) complex. The base 1,1O-phenanthroline combines readily in solution with iron(II) salts in the molecular ratio 3 base:1 iron(II) ion forming the intensely red 1,1O-phenanthroline-iron(II) complex ion; with strong oxidising agents the iron(III) complex ion is formed, which has a pale blue colour.**

# • Some oxidation-reduction indicators

| • Indicator Colour change | Oxidised form | Reduced form |
|---|---|---|
| 5-Nitro-1,lO-phenanthrolineiron(II) sulphate (nitroferroin) +1.25V | Pale blue | Red |
| • 1,1O-Phenanthroline iron(II) sulphate (ferroin) +1.06 V | Pale blue | Red |
| • 2,2'-Bipyridyl iron(II) sulphate +1.02V | Faint blue | Red |
| • 5,6-Dimethylferroin +0.97V | Pale blue | Red |
| • N-Phenylanthranilic acid, +0.89V | Purple red | Colourless |
| • 4,7-Dimethyl-1,1O-phenanthrolineiron(II) • sulphate (4,7-dimethylferroin) | Pale blue | Red |
| • Diphenylaminesulphonic acid +0.85V | Red-violet | Colourless |
| • Diphenylbenzidine +0.76V | Violet | Colourless |
| • Diphenylamine +0.76V | Violet | Colourless |
| • 3,3'-Dimethylnaphthidine | Purplish-red | Colourless |
| • Starch-I;,KI +0.53V | Blue | Colourless |
| • Methylene blue +0.52V | Blue | Colourless |