

**Figure 4:** Variation of inhibitor efficiency with inhibitor concentration for aluminium coupons in 0.5M hydrochloric acid solution containing bitter kola extract at three different temperatures.

### 3.3 Effect of Temperature on the Inhibition Efficiency of Bitter Kola Extract

The effect of increase in temperature on the inhibition efficiency of bitter kola extract is also displayed graphically in fig 4. We can observe from the graph that as the reaction temperature is increased from 30°C to 40°C and to 50°C the inhibition efficiency increases.

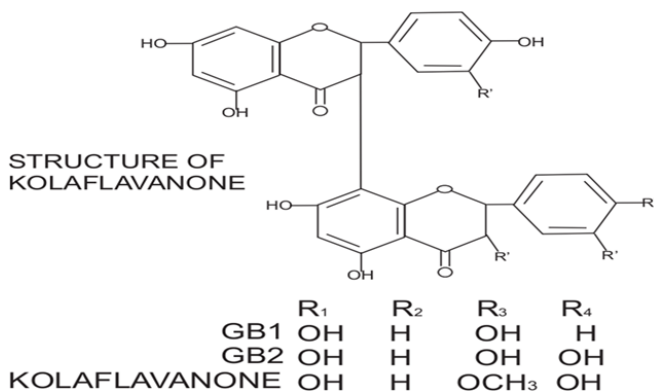
Thus, it is appropriate to say that increasing temperature favours the inhibition efficiency of bitter kola extract on aluminium in HCl.

**Table 1:** Corrosion rate, inhibition efficiency and surface coverage of bitter kola extract on aluminium at 50°C for 210 min immersion period

| Concentration (%v/v) | Corrosion rate (mm/yr) | Inhibition efficiency (n%) | Surface coverage (θ) |
|----------------------|------------------------|----------------------------|----------------------|
| 0.0                  | 1.38                   | -                          | -                    |
| 10                   | 0.68                   | 50.68                      | 0.51                 |
| 20                   | 0.54                   | 62.32                      | 0.62                 |
| 30                   | 0.42                   | 69.05                      | 0.70                 |
| 40                   | 0.40                   | 72.65                      | 0.73                 |
| 50                   | 0.23                   | 82.96                      | 0.83                 |

### 3.4 Active Component of the Extract

The active constituent of garcinia kola is dimeric flavonoid molecules fused together-biflavonoid. Biflavonoid are potent anti-oxidant.



From the structural point of view, bitter kola is a flavanone that contains several electron rich sites for its adsorption

onto the metal surface. The various oxygen atoms at the rings are electron rich and they also serve as adsorption sites to the metal to effect corrosion inhibition.

### Adsorption Mechanism

The inhibitor must have been chemically adsorbed into the metal surface from the temperature effect on the % inhibition efficiency.

### 4. Conclusion

Bitter kola was found to be a highly efficient ecofriendly inhibitor for aluminium in 0.5M HCl solution reaching about 82.96% at 50% v/v and 50°C a concentration considered to be very moderate. Bitter kola is a potential corrosion inhibitor. The percentage efficiency in the presence of inhibitor increases with temperature which indicates a chemical adsorption of the inhibitor molecule on the metal surface.

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