

How do nano-scale fillers improve the corrosion resistance?

Incorporation of nanofillers into a coating generates large interfacial areas in the films, thereby increasing the particle surface concentration (PSC) enormously. Additionally, it helps to create nanoscale resin phases in the interstitial region. These two factors in turn lead to the following effects:

Reduction in permeability: The permeability of the film is considerably reduced due the barrier effect of huge surface area of nano particles. This drastically reduces the ingress of water and oxygen to the substrate. This is shown in Figure 1.

Resin nanophases in the interstices possess high binding properties due to drastic change in their Glass Transition temperature. This is likely to make the film even less permeable.

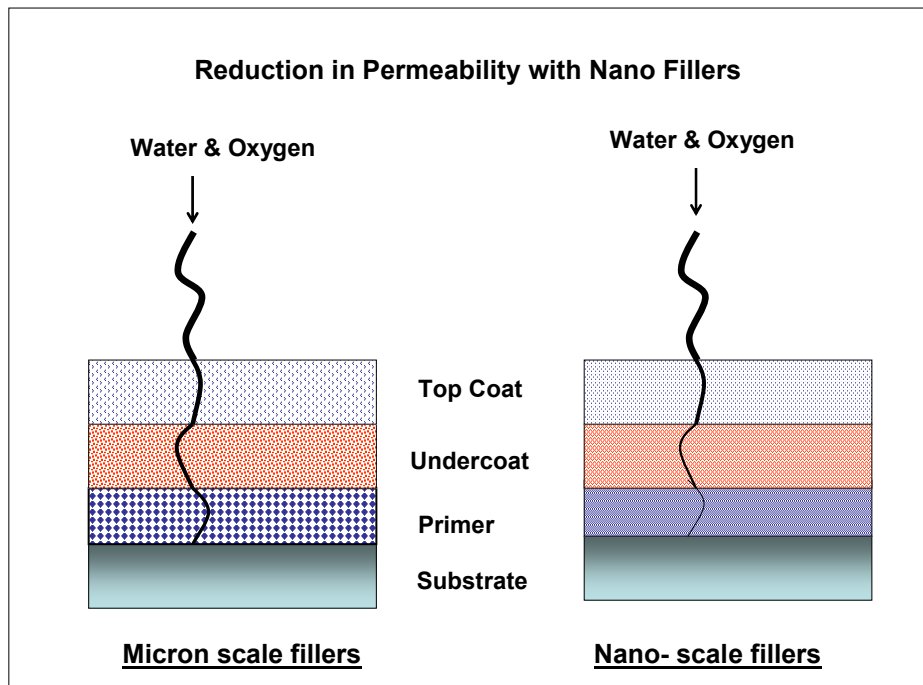


Figure 1: Reduction in permeability with nano-fillers

Improvement in substrate adhesion and inter-coat adhesion:

Nanoparticles and nano resin phases in the bottom layer of the primer in contact with the substrate provide much improved adhesion (Figure 2). The better the adhesion of the film, the less it is vulnerable to corrosion.

In the multi-coat system like, primer, undercoat and top coat, presence of nano particles probably brings about very intimate contact and anchoring between the coats thereby improving inter-coat adhesion. This further contributes to the improvement in corrosion resistance.

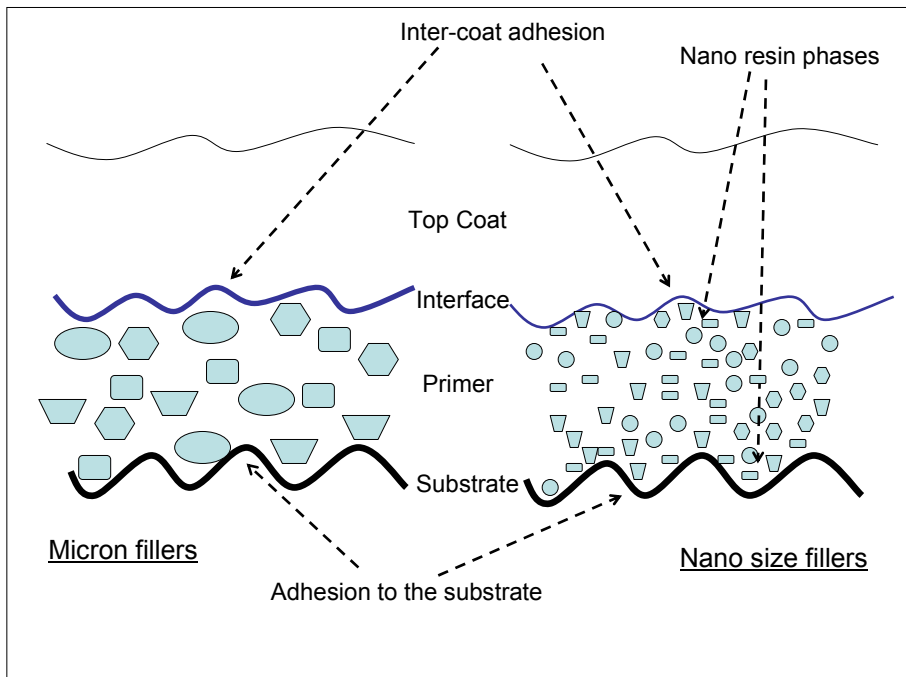


Figure 2: Substrate adhesion and inter-coat adhesion
