**ABSTRACT**

Recently, nanoparticles have drawn attention in alkyd coating industry as it provides multi-performing products. In this study, various nanoparticles such as iron oxide, nickel oxide, titanium dioxide, zinc oxide, zirconium oxide, mixed metal oxides and calcium fluoride as pigment, with other non-toxic additives are impregnated in alkyd resin, produces multifunctional applications. This work focuses to meet increasing demand on fast drying paints with excellent properties. The physical characteristics of the paint such as glossiness, surface roughness, hydrophilic nature, volatile and non-Volatile Organic Compound, etc., are evaluated.

Individual nanoparticles were prepared in bulk amount by adopting various chemical strategies and the size and shape of the particles are confirmed through XRD, FESEM and TEM analysis. All the formed particles were in nano range and could be potentially used as pigment in paint formulation. The paints were formulated by employing high energy ball milling process and used for various studies by coating on glass substrate, A36 steel substrate and in 2-FC opacity card.

The formulated paints having very high gloss level of more than 6, ensure good aesthetic nature of coating and could be readily used for decorative purpose. The volatile compound analysis highlights the formulated paints were in the safe VOC limit suggested by Environmental Protection Agency. The spreading nature of paint is corroborated with the hydrophilic nature of paint showing a very least critical surface tension values below 20 mN/m. Owing to such a least surface tension values, all paints exhibited good adherence, higher spreading rate with protecting ability. After applying the paint on steel or glass substrate, the film thickness obtained is very less (3-5µm), determined from AFM analysis.
All the formulated paints were subjected to evaluate the corrosion protecting ability using wet corrosion and potentiodynamic polarization experiments and found to have better corrosion resistance property. Most of the paints prepared here exhibit higher inhibition efficiency (> 90%) with reference to the A36 steel dipped in 0.1 N HCl, HNO₃ and H₂SO₄ respectively. NIR reflectance study is carried out to use the paint as cool paints; it reveals that in an average, the iron oxide based paint reflects 50% NIR radiation (responsible for the warm effect). Anti-bacterial activity of NiO and CaF₂ dispersed coating showed with high lethal effect to bacterial strains. In future, the coating industry is able to produce nanoparticles dispersed paint as multipurpose paint with lot of market potential.