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Title of Thesis : Development of Nanoconducting Polymers Dispersed Epoxy and Polyurethane Based Protective Composite Coatings

Keywords : Nanoconducting polymers, Nanofillers, Anticorrosive, Nanocomposites coatings, Polaniline, Polythiophene, Microwave synthesis

Abstract

Corrosion causes serious economic and industrial threat as well as latent danger for humans. Further, it is important to mention that the corrosion cannot be prevented but controlled to some extent through the use of different strategies, which retards the corrosion kinetics by altering its mechanism through the use of cathodic protection, protective coatings and corrosion inhibitors or combination thereof . In recent years nanoconducting polymers (CPs) have not only been used as corrosion inhibitors but also as fillers in doped and undoped state via dispersion in insulating polymers, leading to the formation of anti-corrosive nanocomposite coatings**.** The nanoconducting polymer composite coatings have exhibited very promising physic-mechanical, thermal and corrosion resistant properties, which has helped in the development of new generation smart coatings materials.

Due to highly toxic and carcinogenic nature, hexachromate has been worldwide banned by the act of environmental legislation. Thus, there is an urgent need to develop some green alternative surface pre-treatment technique to replace the passivation technique. Literature revealed that in the field of corrosion protection CPs act as green primers, e.g., PANI and its various derivatives like poly (o-anisidine) could act as a promising alternative to the

chromate passivation technique owing to their ease of synthesis, availability, cost effectiveness and stability.

The thesis describes the synthesis and characterization of novel conducting nanoparticles (viz Poly(o-anisidine) (PoA), tartaric acid-dodecylbenzene sulphonic acid doped PoA (TA-DBSA-POA) nanofibres, Poly(o-anisidine-co-o-phenyldiammine) [PoA-co-opda)] nanorods, Polyboroanisidine (PBoA) nanospheres as well as that of Polythiophene via conventional (cPTh) and microwave routes (mPTh). However, to the best of our knowledge the microwave synthesis and other methods used for other nanoparticles was done for first time The formulation of their nanocomposites coatings by dispersing them in epoxy and polyurethane matrix. The physico-chemical, spectral, morphological, phase purity and structural characterization of nanoparticles and their nanocomposites coatings are discussed in the thesis. The incorporation of impact of these nano fillers in the organic matrix on hydrophobicity, physico-mechanical (scratch hardness, bend test and impact resistance) and corrosion resistance performance was studied. The corrosion resistance performances of these coatings were investigated with the help of potentiodynamic polarization, electrochemical impedance spectroscopy and salt spray techniques. The corrosion studies were conducted in saline as well as acidic media, varying pH concentrations (1, 3, 5, 7, 9 and 11) were also used for first time to check the corrosion protective ability of nanocomposite coatings.

Further, it can be concluded that there is still immense scope for the future research and improvement in various properties of conducting polymer nanocomposites and generation of new improved nanofillers for the development of nanoconducting polymer based coatings.