ANTI-CORROSIVE PROPERTIES OF ALKYD RESIN/POLYANILINE/CALCIUM CARBONATE NANOPARTICLES AT VARIOUS pH VALUES ON MILD STEEL SURFACES

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Corrosion of metals is a major problem in the modern world. Value of steel decreases by corrosion and the society spends a large amount of money to overcome corrosion since the effect of corrosion is capacious. Various procedures are used to minimize the effect of corrosion such as applying organic/inorganic coatings, systematic designs and alloying. Conductive polymers are widely used to make such coatings. Polyaniline based compounds get special heed of researchers because of its interesting properties namely, various structures, electrical properties, good use in an acidic medium, low cost, light weight. Calcium carbonate is widely used filler in several industries.

In this research, polyaniline/calcium carbonate composite based coating is made by using sodium persulfate as an oxidizing agent for the polymerization of aniline at different pH values. Characterization was done by X-ray diffraction patterns and Fourier Transform Infrared spectra analysis. Corrosion rates of alkyd resin/polyaniline/calcium carbonate composite coatings were studied over the period of 2 months by applying it on a mild steel surface, through linear scan voltammetry studies and impedance analyses.

It is found that the pH of the preparative medium of the composite has a decisive effect on the crystallographic phase of the calcium carbonate obtained. At high pH, it is more favorable to form calcite in the precipitated calcium carbonate/polyaniline composite material. The lowering of pH tends to stabilize the vaterite form and when the pH is 8, only the vaterite form is obtained. When the pH of the preparative medium is below 8, amorphous $CaCO_3$ is favored and $CaSO_4$ is found in the composite material. However, there is no proper relationship between polyaniline to $CaCO_3$ ratio with the change in pH. The optimum anti-corrosive properties are gained by sample prepared at pH 8 which has vaterite polymorphism of calcium carbonate. Corrosion rate is gradually increased in all samples with time but the rate of increase is minimum in the sample prepared at pH 8. Initial corrosion rate of the latter sample is 1.91×10^{-4} mm/year. After one month, it increases up to 2.11×10^{-4} mm/year and further increases after two months up to 3.46×10^{-4} mm/year. Although, there is an increase in corrosion rate with time, the values are so low that corrosion of mild steel can be successfully suppressed by applying polyaniline/vaterite composite coating on its surfaces.