Editorial

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Editorial Note on Chronology of Corrosion Inhibitors

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Editorial Note

Corrosion is process of chemical degradation of materials. Though, corrosion is generally associated with metals and alloys, the process have been reported for all kinds of materials including polymers due to its exposure to its environment. The environment may be gaseous with or without moisture, or it could be liquid and may be either aqueous or non-aqueous electrolytic solutions. Corrosion may occur either from the surface of the material or can impact the bulk of the material. Damage caused due to the corrosion can lead to the great economic loss to the industries and infrastructures. Many times, once corrosion starts the materials deterioration is undoubtedly inevitable. Since time immemorial humans has been exploring different kinds of corrosion inhibitors including thermal sprays and protective coatings that can inhibit or slow the process of corrosion for diverse kinds of materials used in industries and infrastructures.

Thermal spraying removes moisture content from the environment and provides protection to some extent only and can be used only is select conditions. Protective coating of corrosion inhibitor is more promising and is most popular process for preventing corrosion. The corrosion inhibitors adhere to the surface of metal and metal oxide through weak physical or chemical bonds via adsorption, chemisorption, complexation or precipitation and thus inhibit the oxygen and/or hydrogen to be reach the material. Corrosion inhibitors are commercially available in vast variety and due to their specificity; selection of suitable corrosion inhibitor is the real challenge for the investigators. Metal chromates have long been exploited as corrosion inhibitors in many industries both in aqueous media like in cooling towers and radiators as well as in surface coating such as paints and protective coatings. Metal chromates are reported to be carcinogenic in nature and its use has been banned or limited in different industries since 1975 in many countries. Phosphates, molybdates, borates and silicates have been explored as non-chromate inorganic and less toxic corrosion inhibitor. Rare earth salts have also been explored and used as promising alternative but they score low for adhesion, barrier characteristics of sol-gel coatings and fast discharge from the sol-gel coatings that reduce their efficiency as corrosion inhibitors. Inorganics corrosion inhibitors have turned out to be toxic and are not environment friendly. This has led to exploration of organic compounds in recent times as potential corrosion inhibitor. Focus has primarily been on organic compounds which has one or more polar function and thus can prove to be a promising non-toxic, environment friendly corrosion inhibitor.

Phosphorus (P), oxygen (O), Nitrogen (N) and Sulfur (S) are the most common heteroatoms that establish the adsorption centers onto the material surface and the organic compound bearing these heteroatoms act as good corrosion inhibitors. Corrosion inhibition efficiency of these hetero-compounds is directly attributed with their high degree of polarizability and lower electronegativity. These heteroatoms can easily donate their lone pair of electron to the empty orbitals of metal atoms and hence can cover varied range of metallic surfaces. Corrosion inhibition efficiency of the compounds containing heteroatom generally obeyed the reverse order of their electro-negativities. These inhibitors protect the metal in humid conditions first by displacing water molecules from their surfaces and then intervene with corrosion reaction by forming diffusion barrier or by blocking reaction onto the both of the electrodes and thus prevent the transportation of water and other corrosive active species. Till now wide ranges of organic substances have been studied for their better corrosion inhibition properties that include mono and poly-carboxylates, amino acids amines and alkanol amines but main disadvantages associated with these organic inhibitors are their high cost and hazardous nature. Search for low cost, non-hazardous organic corrosion inhibitors has led to Thiadiazoles which have shown very promising results. Recent research on these compounds have shown tremendous corrosion inhibition properties due to the presence of two nitrogen atoms and one Sulphur atom along with two double

bonds within the five membered heterocyclic ring. The planar geometry and lone pairs of electrons present on the heteroatoms leads to the better adsorption of these compounds on the metal surface. Non-cytotoxicity and environmentally friendly property of these compounds makes them superior among their available toxic organic inhibitors.