SUMMARY

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In recent years, there have been several attempts to use the sophisticated techniques as anti-corrosive system for steel. The results of investigations have very often pointed to the use of epoxy resin-based paints in this field. In this respect, the present investigation aims to produce the epoxy resins based on Schiff's aromatic compounds to increase the thermal stability of these resins.

In this investigation, epoxy binders were prepared from Schiff's base monomers and polymer through two steps. The first step is based on condensation of hydroxy benzaldehyde derivatives with o- and p-phynelenediamine or by formation of 5, 5ˉ -Methylene –bis-salicylaldehyde followed by condensation with phenylene diamine. In this respect, o-, m- and p- hydroxy benzaldehyde were used. The second step includes the reaction between Schiff's base monomer and polymer with epichlorohydrin (EC) to produce epoxy binder. The synthesized epoxy binders were characterized by determination of epoxy contents and epoxy functionalities.

The chemical structures of both Schiff's base monomers and polymers were determined by elemental analysis, IR and ^{1}HNMR spectral analysis. The molecular weights of the produced epoxy resins were determined by GPC. The

chemical structures and epoxy functionalities were determined by ^{1}HNMR analysis. The epoxy functionalities, determined from ^{1}HNMR, were compared with the calculated values. This comparison revealed that the ^{1}HNMR is a reliable technique for estimating the values of epoxy functionality. The thermal stability and characteristics of the prepare Schiff's base monomers and polymers as well as their epoxy resins were measured and evaluated by DSC and TGA analysis.

The prepared epoxy resins were cured with polyamine based on aromatic and aliphatic amines. In this respect, pentaethylenehexamine (PEHA) and p-phenylene diamine (PDA) were used as aliphatic and aromatic amine, respectively. The thermal stability of the cured resins was evaluated by DSC and TGA. Thermal stability data indicate that epoxy resins cured with aromatic amine possess higher thermal stability than that cured with aliphatic amine. The cured Schiff's base epoxy polymer have high thermal stability than epoxy monomer although the uncured polymer resins having low thermal stability data than its representative monomer. The curing, melting and glass transition temperatures were measured by DSC technique. The curing conversion precentages were measured by DSC. The data indicate that the cured epoxy resins with aromatic amines have high conversion percentages than that cured with aliphatic amines.

The cured epoxy polyamine systems were evaluated in coating applications of steel by measuring the mechanical properties and chemical resistance of the cured films. The curing experiments were formulated as solvent- based liquid coatings. In this respect, epoxy resins were mixed with curing agents based on both PDA and PEHA at ratio 4:1 (wt of epoxy: wt of hardener), the mixed ratios are dissolved in 10% of methylethylketone MEK (wt% base and hardener) to dissolve polyamine hardeners. The mechanical properties of cured films were determined by measuring their adhesion, impact, hardness and bending resistance. The data reveal that the increment of epoxy functionalities increase the mechanical properties of the cured films.

The chemical resistances of the cured films were estimated by measuring their acid , alkali and solvent resistances. It was also observed that the cured epoxy resins based on PEHA at mixing ratios (4/1) show defects with both alkaline and acidic aqueous solutions. This can be attributed to the lower crosslink density of network and increase the attack of polar groups of network and dangling chains to acidic and alkaline solutions.

The corrosion testing of cured films was evaluated by salt spray methods. The data indicates that Schiff base epoxy monomers and polymer show excellent salt spray resistance. This can be attributed to the ability of these resins to form stable adhesion with steel due to high epoxy functionality and their ability to form coordination bonds with steel. It was observed that the cured films have higher epoxy crosslink density or higher epoxy functionalities show better corrosion protection efficiencies than the cured films with low crosslink density or lower epoxy functionalities.