SUMMARY AND CONCLUSION

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Brass is an alloy (Cu-Zn) commonly used for decoration purposes and also in heat exchanging systems. Brass is widely used in many industrial fields, especially in marine applications. Copper alloy are essential materials and meet the industrial requirement as well as commercial applications. It is due to the nature of brass possesses an attractive combination of properties namely, good corrosion resistance, good machinability, high thermal and electrical conductivity and better resistance to biofouling. Hence it finds extensive use in water treatment unit, condensers heat exchangers in oil, chemical and petrochemical industries and in processing plants used for electricity generation and desalination. Copper alloys represent an important category of nonferrous alloys, which are widely used as materials in various cooling water systems and shipboard condensers.

Due to the various industrial applications and economic importance of brass its protection against corrosion attracted much attention. However it corrodes easily in chloride containing aqueous solutions and air, which limits its use. One of the most importance methods in corrosion protection is to use inhibitors.

Organic compounds containing an azole nucleus have been found effective inhibitors for copper alloy in a variety of aggressive environments. Heterocyclic organic compounds containing nitrogen, sulphur and oxygen atoms are often used to protect metals from corrosion among them azoles have been intensively investigated as effective copper corrosion inhibitors. Benzotriazole is one of the most important inhibitors for copper and copper alloys. Benzotriazole (BTA, is an efficient corrosion inhibitor for copper alloys. The copper surface reacts with physically adsorbed benzotriazole molecules to precipitate in soluble Cu-BTA complexes effect of 2-hydroxyl ethyl benzotriazole (HEBTA), nitrobenzotriazole (NBTA), and bromo benzotriazole (BBTA) on brass corrosion as corrosion inhibitors in 3% NaCl solution have been studied and the outcome results can be summarized as follows. Azole derivatives like benzotriazole. Such as 2-hydroxy ethyl benzotriazole (HEBTA), nitro benzotriazole (NBTA) and bromo benzotriazole (BBTA) contain nitrogen atoms. Which co-ordinate with Cu(O), Cu(I) or Cu (II) through lone pair electrons to form complexes. These complexes are generally accepted to be polymeric in nature and form an adherent

protective film on the copper surface (Lakshminarayanan et al 1994 EI- Saye.M. sherif) in the present investigation efforts are taken to study the corrosion inhibition behaviors of brass.

In the present study, HEBTA, BBTA and NBTA are synthesized and characterized using FT-IR spectral data. Synthesized inhibitors are utilized for corrosion inhibition studies of brass in 3% NaCl. NaCl is an important corrosion constituent that attacks the components of gas turbines in marine environments, accelerating oxidation of the alloy. The NaCl accelerated oxidation is generally considered the result of the formation of volatile species beneath the oxide scale. Copper and its alloys are applied extensively in marine environments due to their high corrosion resistance in sea water. In addition, copper dissolution in chloride solutions is very important in the electro polishing, electro machining industries and cooling water system. Due to these reasons attention has focused on the behaviour of brass in chloride solutions. Hence 3% NaCl was selected to study the inhibition effect of derivatives of benzotriazole on brass. Classical weight loss methods and electrochemical methods such as linear polarization techniques, electrochemical impedance spectroscopy techniques and cyclic voltammetry techniques were carried out to assess the inhibitive effect of BTA derivatives in 3% NaCl medium.

- ❋ All the substituted BTA derivatives show good inhibition efficiency in 3% NaCl solution. It is due to the adsorption of the inhibitor molecules on the brass surface and blocking of active sites.
- ❋ From the effect of BTA derivatives on exposure period, the inhibition efficiency of the substituted BTA derivatives follows the order.
  BBTA (99%) > NBTA (93%) > HEBTA (83.5%).
- ❋ BTA derivatives are adsorbed on the brass surface according to Langmuir and Temkin isotherms. Inhibitors molecules can form very stable chemisorbed film on brass surface. They act as a barrier film and protect brass against corrosion in chloride solution in the presence of the investigated inhibitors.
- ❋ Thermodynamic parameters ($-\Delta G$, ΔH and ΔS) for the corrosion of brass in 3% NaCl were calculated and indicated that there is a strong interaction between the brass surface and inhibitors molecules.
- ❋ Polarization studies showed that benzotriazole derivatives such as HEBTA, NBTA and BBTA behave mainly as anodic inhibitors for brass in chloride

solutions. They decrease the anodic reaction rate more strongly than the cathodic reaction and behave like mixed type inhibitors predominantly anodic for brass in 3% NaCl.

- The corrosion of brass in 3% NaCl from EIS measurements is controlled by charge transfer as well as mass transport ie the transport of Cl^- ions to the electrode surface and $CuCl_2^-$ ions from the electrode.
- The cyclic voltammograms obtained in the presence of inhibitors strongly reduce both cathodic and anodic peaks and thus confirm the effectiveness of the inhibitors in the current study.
- The inhibition efficiency of the benzotriazole compounds is due to donor-acceptor interactions between the πelectron of the inhibitor and the vacant d-orbital of copper surface or an interaction of inhibitor with already adsorbed chloride ions
- Due to the nature of brass, IE obtained using electrochemical method was found to be greater than the IE obtained using weight loss method.