# Use of some azodyes as inhibitora for the corrosion of c-steel in hcl and nacl solutions

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As known that the economic power of a country is determined by its output of steel. So, studies of steel properties in general and electrochemical, especially, have been received a great attention. In such respect, the corrosion and corrosion inhibition of C-steel in the different media become very interesting and important owing to its wide applicability in industry and domestic life. The purpose of the present investigation is to study the effect of various concentrations of different surfactants on the protection efficiency of C-steel corrosion at different temperatures. This was done using electrochemical (potentiodynamic, ac impedance, electrochemical frequency modulation) techniques.The thesis comprises three main chapters:Chapter I is concerned with an introduction, reviewing concisely the corrosion definition, types and theories of corrosion and reviewing concisely the relevant literature related to the subject of the thesisChapter II deals with the experimental part. It includes composition of C-steel used, the preparation of the test specimens for the different techniques of measurements and methods of preparation of materials of various solutions used. Also, the procedures followed for corrosion measurements, potentiodynamic, EIS and EFM techniques are including in this chapter.Chapter III deals with the results obtained and their interpretations. It included the following points:1. The five azodyes, namely:(E)-2-(2-(4--methoxyphenyl)hydrazono)-3-(1H-indol-3-yl)-3-oxopropanenitrile, (E)-2-(2-p tolylhydrazono)-3-(1H-indol-3-yl)-3-oxopropanenitrile, (E)-2-(2-phenylhydrazono)-3-(1H-indol-3-yl)-3-oxopropanenitrile, (E)-2-(2-(4-chlorophenyl)hydrazono)-3-(1H-indol-3-yl)-3-oxopropanenitrile and (E)-2-(2-(4-nitrophenyl)hydrazono)-3-(1H-indol-3-yl)-3-oxopropanenitrile which have been used as corrosion inhibitors for C-steel in acidic medium by potentiodynamic technique . Also, the effect of temperature on the corrosion rates in the presence and absence of these compounds in acidic medium was studied.2. The effectiveness studied also in the absence and presence of different concentrations of used compounds by ac impedance technique.3. The effectiveness studied also in the absence and presence of different concentrations of used compounds by EFM technique.4. The activation parameters were calculated from Arrhenius equation and transition state equation5. Several adsorption isotherms were assessed and theLangmuir adsorption isotherm was found to be the best description of the adsorption behavior of the investigated compounds6. The quantum-chemical calculations for studying the effectiveness of the used corrosion inhibitors.from all experimental techniques, we observed that the investigated compounds inhibit the corrosion of C-steel at all used concentrations. The inhibition efficiency increases with increasing the inhibitor concentration. The order of decreasing inhibition efficiency is:(1) > (2) > (3) > (4) > (5)The increase of Ea* in the presence of the investigated compounds indicates the physical adsorption that occurs in first stage, weak chemical bonding between the inhibitor and the steel surface or due to the decrease in the adsorption of these compounds with increase in temperature .The values of □H* are positive indicating that the corrosion process is endothermic one. The values of Ea* are larger than the analogous values of □H* indicating that the corrosion process must involve a gaseous reaction, simply the hydrogen evolution reaction, associated with a decrease in the total reaction volume.The entropy of activation (ΔS*) is negative in both in the absence and presence of additives implying that the activated complex represented the rate determining step with respect to the association rather than dissociation step.The adsorption of the investigated compounds obeys the Langmuir’s adsorption isotherm. The negative values of ΔG◦ads suggested that the adsorption of inhibitor molecules onto steel surface is a spontaneous process.Some quantum-chemical quantities were calculated .The above trend of inhibition efficiency is explained on the basis of the differences in electron charge density (either electron donating or electron withdrawing character).