Some natural occurring substances as conosion inhibitors for petroleum pipelines in different media

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The aim of the present work is to study the corrosion behavior of carbon steel used in petroleum pipe lines in 0.5 M NaOH using natural oils namely, e.g (ginger oil ,garlic oil, cinnamon oil) and their extract (ginger extract, garlic extract cinnamon extract,) in 0.5 M H¬2SO4 .The thesis comprises three main chapters:-Chapter 1:-This chapter deals with the introduction, which includes definition, classification of corrosion, corrosion inhibitors. Literature survey on corrosion behavior of carbon steel in aqueous solutions.Chapter 2 :-Deals with the experimental part includes complete description of the working procedures, includes the chemical composition of the investigated carbon steel (G-1018), preparation of solutions, electrode treatment, electrolytic cell and electrochemical measurements.Chapter 3 :-In this part (A) potentiodynamic anodic polarization curves of carbon steel in 0.5 M H2SO4 solution containg different concentrations of NaCl solution and also, potentiodynamic anodic polarization curves of carbon steel in 0.5 M NaOH solution containg different concentrations of NaCl solution were studied. It was found that the addition Cl- ions cause the destruction of the passivation oxide film and initiate pitting corrosion. The pitting corrosion potential for these additives are shifted to more negative values with increasing chloride ion concentrations. Trials were made to inhibit the pitting corrosion of carbon steel by using natural oils in NaOH solution and their extract in H2SO4 solution. These compounds shifted the pitting potential to more positive values, indicating the inhibiting effect of these compounds.Part (B):This part study the effect of addition of different concentrations of natural oils and their extract on the galvanostatic polarization curves of carbon steel in 0.5 M H2SO4 and 0.5 M NaOH, respectively. Some corrosion parameters were calculated such as corrosion potential (Ecorr), corrosion current density (Icorr), anodic (ba) and cathodic(bc) Tafel slopes. By increasing the concentrations of natural oils and the extract of these natural oils the corrosion current density decrease and consequently the inhibition efficiency is increased. The inhibition percentage efficiency of the additives is arranged in the following orders:Ginger extract > Garlic extract>Cinnamon extractGinger oil >garlic oil > cinnamon oilThe adsorption isotherm for each natural oils and extract on the steel surface follow Langmuir adsorption isotherm at constant temperature.Part (C):This part contains the results of the potentiodynamic anodic polarization curves of carbon steel in 0.5 M H2SO4 in absence and presence of some extract of natural oils at scanning rate of 50 mV

sec-1.Also, the effect of some natural oils towards the corrosion of carbon steel in 0.5 M NaOH was studied. These results indicated that:There is one anodic peak (A) due to the dissolution of iron.The values of peak anodic current decreases and consequently the inhibition efficiency increases indicating an increased resistance to corrosion.Part (D):Contains the results of weight loss of carbon steel under investigation in 0.5 M NaOH using natural oils namely, e.g (ginger oil ,garlic oil, cinnamon oil) and their extract (ginger extract, garlic extract cinnamon extract,) in 0.5 M H¬2SO4 .results revealed that:In general, for all additives, by increasing the concentration the weight loss decreased, indicating the inhibiting effect of these additives.The inhibition percentage efficiency of the additives is arranged in the following orders:Ginger extract > Garlic extract>Cinnamon extractGinger oil >garlic oil > cinnamon oilThe corrosion rate (k) values of C-steel in 0.5M sulfuric acid and in 0.5 M sodium hydroxide was decreased by increasing the concentration of the additives.The variation of the degree of surface coverage (θ), with (logC) for C-steel in the presence of different additives e.g. natural oils namely, e.g (ginger oil ,garlic oil, cinnamon oil) in 0.5 M NaOH solution and their extract (ginger extract, garlic extract cinnamon extract,) in 0.5 M H¬2SO4 solution gives a straight line relationship. This means that the adsorption of these compounds on the steel surface obeys the Temkin’s adsorption isotherm.Part (D):-In this part the mechanism of inhibition for the additives compounds was suggested.-This thesis contains also references, English and Arabic summaries.