Corrosion behavior of tin in aqueous solutions

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The corrosion problem is a great problem, which faced the world from the last years until now, we can not hide this problem from our live but we can reduce ”inhibit” it in the metals and alloys by several methods as the environment need. This work discusses the corrosion inhibition of tin electrode in $NaHCO_3$ and NaCl solutions by using some plants extracts, e.g. lawsonia, licorice root and carob, and some inorganic compounds such as sodium salts of CrO_4^{2-}, MoO_4^{2-}, WO_4^{2-} and HPO_4^{2-} ions.This work contains three basic chapters:Chapter 1: includes an introduction about the corrosion, its inhibition and the correlations between inhibition and stability of organic compounds were explained. The effect of inhibitors on polarization behavior and factors affecting the adsorption of inhibitors on metal were discussed. The adsorption isotherms were elaborated. A literature review on corrosion inhibition of tin was given.Chapter 2: deals with the experimental part include complete description of the working procedures, preparation of solutions, electrode pretreatment, electrolytic cell and electrochemical measurements.Chapter 3: presents the results and discussion of the data obtained. This chapter is divided into four parts as follow:Part (1): includes studying the corrosion behavior of tin electrode in $NaHCO_3$ and NaCl solutions by cyclic voltammogram curves. The results showed that:i) The corrosion increases with increasing the concentration of both $NaHCO_3$ and NaCl and increases with increasing the scan rate.ii) In $NaHCO_3$ solutions the cyclic voltammogram curves include two dissolution peaks, permanent passive and transpassive peak and also three reducing peaks, which may be due to:• The oxidaton of tin into $Sn(OH)_2$ and/or SnO.• The oxidation of $Sn(OH)_2$ and/or SnO into $Sn(OH)_4$ and/or SnO_2.• The current decreases until reach Ipass then third peak appears due to solid phase transformation, then current increases due to oxygen evolution.• Three reduction peaks appear due to the reduction of the compounds result from the dissolution peaks.ii) In NaCl solutions the cyclic voltammogram curves include two dissolution peaks, then the current increases rapidly and two reduction peaks appear, which may be due to:• The oxidaton of tin into $Sn(OH)_2$ and/or SnO.• The oxidation of $Sn(OH)_2$ and/or SnO into $Sn(OH)_4$ and/or SnO_2..• Then the current decreases until reach Ipass then the current increases rapidly due to the pitting corrosion.• One of the two reduction peaks is due to the reduction the pitting corrosion products and the other is due to reduction the compounds results in the two oxidation peaks.Part (2): includes the corrosion inhibition of tin electrode in $NaHCO_3$ and NaCl solutions using some inorganic compounds such as sodium salts of CrO_4^{2-}, MoO_4^{2-}, WO_4^{2-} and HPO_4^{2-} ions and some plants extracts by using galvanostatic polarization method.The results showed that the inorganic compounds and the plants extracts are good inhibitors, except MoO_4^{2-} in NaCl solutions. The inhibition efficiency of the additives increases with increasing their concentrations.Part (3): includes the pitting corrosion inhibition of tin electrode in $NaHCO_3$ and NaCl solutions using some inorganic compounds and some plants extracts by using potentiodynamic polarization method.The results showed that the inorganic compounds and the plants extracts are good inhibitors, except licorice root in $NaHCO_3$ solutions. The inhibition efficiency of the additives increases with increasing their concentrations.Part (4): includes mechanism of inhibition for the additives compounds.This thesis contains also references, English and Arabic summaries.