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ROSEMARY OIL AS A CORROSION INHIBITOR FOR CARBON STEEL IN 0.5 M SULFURIC ACID SOLUTION

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The possibility of using rosemary oil as a corrosion inhibitor of carbon steel in 0.5 M sulfuric acid solution was investigated by determination of weight loss, potentiodynamic polarization, and electrochemical impedance spectroscopy. It was shown that the inhibition effectiveness increases with an increase in the concentration of oil and a decrease in the temperature. The inhibiting effect of the investigated oil is due to its adsorption on the surface of the steel and complexation. Adsorption is described by a Langmuir isotherm. The effect of the temperature on the corrosion rate was studied in the presence and absence of the oil and the thermodynamic parameters of the corrosion process were calculated.

Key words: *hydrocarbon steel, rosemary oil, inhibitor, electrochemical impedance spectroscopy.*

Equipment made of carbon steel is widely used in the oil industry [1]. The main problem in using this steel is its low corrosion resistance in acid medium. Aqueous solutions of acids, primarily sulfuric acid, are used for scouring, cleaning boilers, descaling , and acid treatment of wells [2, 3]. These solutions are some of the most corrosive media.

One method of protecting carbon steel from corrosion is to use organic inhibitors [4-8], which are heterocyclic compounds containing phosphorus, sulfur, oxygen, or nitrogen and have π bonds [9, 10]. Almost all of these compounds are unfortunately very expensive and hazardous to the environment. For this reason, it is very important to select an inexpensive inhibitor that is safe to use. Some natural oils were previously investigated as corrosion inhibitors for metals and alloys [11-14]. We investigated the inhibition effectiveness of rosemary oil for carbon steel in 0.5 M sulfuric acid solution.

Carbon steel L-52 of the following composition, wt. %, was used in the experiments: 0.26 carbon; 1.35 manganese; 1.04 phosphorus; 0.05 sulfur; 0.05 niobium; 0.02 vanadium; 0.03 titanium; remainder – iron. The weight loss of steel plates with a total surface area of 4 cm^2 was determined with the method described in [15]. The samples were immersed in 0.5 M sulfuric acid solution (50 ml) with no inhibitor and with rosemary oil in different concentrations and held for 6 h. Cylindrical electrodes surrounded by Araldite with an open surface area of 0.64 cm^2 were used for the studies by potentiodynamic polarization and electrochemical impedance spectroscopy. Before conducting the experiments, the electrodes were polished with different types of emery paper, degreased

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