conferenceseries.com

World Congress on CHEMISTRY AND CHEMICAL TECHNOLOGIES

February 09, 2022 | Webinar

Inhibition of carbon steel corrosion in sodium chloride solution by anionic biosurfactants

Amel Asselah and Ammal Tazeterouti
University of M'Hamed Bougara, Algeria

Abstract

Statement of the Problem: Corrosion often occurs in the industry of a material oil and gas. Carbon steel is a type of material that is commonly used for various applications in the industrial field. One of those types of carbon steel which is often used in this industrial field is API 5L steel "Grade X70". The API 5L steel is one of the steels used in the applications of water transport, oil, and natural gas. This type of steel is easy to be corroded in acidic solution environment. In fact, corrosion cannot be prevented but its speed can be controlled by the addition of an inhibitor. Inhibitor is a substance, which is capable of inhibiting or reducing the rate of metal corrosion with the environment. In this case, there are many researches done in order to find a new source of the corrosion inhibitor mainly from the natural materials. The organic material used as the inhibitor belongs to a class of surfactants, which is chosen as the alternative because of it characteristics, which are safe, easily available, biodegradable, cheap, and ecoenvironment [1]. The purpose of our current work for the green chemistry and corrosion inhibition medium, mainly focused on studying the corrosion inhibition performances and mechanism of anionic sulfonate surfactants synthetized from fatty acids, as sulfo lauryl methyl ester and sulfo palmityl methyl ester [2, 3]. Methodology & Theoretical Orientation: Different techniques including weight loss measurements, open circuit potential (OCP), electrochemical impedance spectroscopy (EIS) and Tafel methods [4- 6] meanwhile, putting forward and detailing the adsorption mechanism have been carried out. Scanning electron microscopy (SEM) coupled to energy dispersive X-ray spectroscopy (EDX) was also used to observe the surface morphology. Findings: Gravimetric method shows a good efficiency- C12-MES at 40 °C shows a good efficiency which reaches 78% for sulfo lauryl methyl ester compared to 58,5% for sulfo palmityl methyl ester at 50 ppm. The OCP results show that the corrosion potential of sulfo lauryl and palmityl methyl ester at 35 °C and at 65 °C generally move towards more electropositive values. This suggests that their behavior is cathodic. By the technique of EIS, the results show that the efficiency increases from 28% to 87,20% when the temperature increases from 35°C to 65 °C. By against, sulfo palmityl methyl ester gives a high efficiency at 35 °C and 65 °C, which is 71% and 95% respectively. By Tafel technique, the potential values show that the surfactant inhibitors have anodic behavior at 35 °C and 65 °C, except sulfo palmityl methyl ester at 65 °C, which has a cathodic behavior at 35 °C. The MEB photomicrographies show that the adsorption of the molecules of the studied surfactants on the surface of the metal leads to the formation of a protective film limiting the corrosion.

Conclusion & Significance: The results obtained indicate that sulfo lauryl methyl ester exhibit significant corrosion inhibition property for "X70" steel in 2,5g/L Na Cl solution. The inhibitors inhibit the corrosion of steel in sodium chloride medium by physical adsorption mechanism. The results from electrochemical and gravimetric measurements were in good agreement. EDX confirmed the fixation of surfactants on steel by the appearance of sodium in the elemental analysis of steel and the increase of the carbon and sulfur content.

Biography

Amel Asselah has her expertise in chemistry. Her experience as reasercher in organic chemistry at the University of Houari Boumediène, Bab Ezzouar- Algeria and teacher (Associate Professor) in the University of M'Hamed Bougara, Boumerdès- Algeria allowed her to enter the world of surfactants, photochemical synthesis, characterization, physico-chemical properties and applications. Her works focus on photochemical synthesis of biosurfactants that opens up a range of applications such as detergency, enhanced oil recovery, foaming, emulsification and inhibition of corrosion.