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Biomass-derived corrosion inhibitors with real application in oil production fields

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CO2 corrosion is one of the greatest challenges faced by the oil and gas industry, as it is one of the main forms of deterioration of metallic materials. Although mild steel is susceptible to corrosion processes, it is still widely used in this industrial segment due to its good mechanical strength, natural abundance, and low cost [1]. In the oil and gas industry, corrosion inhibitors are mainly used to combat corrosive processes related to the action of H2S, CO2 and acids used in reservoir stimulation operations and/or removal of incrustations from pipes. The development of green corrosion inhibitors with high efficiency aimed at oil production fields is a challenge. Some molecules can offer less risk of toxicity to the environment and operators, and still act as a corrosion inhibitor. In this context, the development of molecules derived from products obtained from renewable raw materials, which can generate a new environmentally friendly corrosion inhibitor, with potential for real use in the oil and gas industry, is the motivation of this work. In the literature, few studies involve the use of green inhibitors for corrosion in an aqueous environment with high salinity CO2-containing and in absence of oxygen. The biggest challenges are finding effective inhibitors for these media prevalent in the oil and gas industry and understanding the corrosion mechanism involved in this corrosive process. In the present study, two molecules derived from biomass were investigated as potential green corrosion inhibitors for 1020 mild steel in CO2-saturated formation through electrochemical impedance technique, polarization curves and mass loss under static. Molecules A and B were synthesized in a single step by a sustainable method using a biomass derivative as starting material and ethanol as solvent. The yields were 56% and 93%, respectively. The synthesis of product A is reported in only one work while product B is unpublished. The results showed a high inhibition efficiency (IE) for mild steel immersed in CO2-saturated formation water (IE~95% for 1x10-4 mol L-1). This result is very promising, since the inhibitor comes from an eco-friendly molecule and, even at a low concentration, a high efficiency of inhibition was achieved.