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RESEARCH HIGHLIGHTS

Corrosion inhibitor is a promising method of protection towards acid corrosion due to its capability of adsorbing onto the metal surface to form a protective film. Organic inhibitors, also known as green inhibitors, are the best substitute for conventional corrosion inhibitors due to their economic advantage and high efficiency. Plants are one of the sources of organic compounds that contain heteroatoms; oxygen, nitrogen, sulfur, and phosphorus that are crucial for corrosion inhibition. The compounds protect the metal by adsorption of the active compounds on the surface that forms a protective barrier between corrosive media and metal surface. Oil palm empty fruit bunch (OPEFB) biomass is produced in a considerable amount by oil palm industries with up to 23% OPEFB per ton of fresh fruit bunch. Due to the massive buildup of OPEFB waste, the disposal issue is becoming a serious problem. Oil palm empty fruit bunch (OPEFB) in the form or raw, HCl treated and NaOH treated powders were investigated for their inhibitive effects on mild steel in 1 M hydrochloric acid medium via gravimetric approach and surface analysis. Weight loss analysis revealed that the inhibition efficiency is the highest for HCl treated powder (85.66 %), followed by raw OPEFB powder (80.75 %) and NaOH treated powder (62.31%). Surface morphology results showed that the compounds formed protective film on the steel surface and shield it from the acid attack. The inhibition efficiency of HCl treated OPEFB powder was further optimized using response surface methodology (RSM), quantum chemical calculation and molecular dynamics simulation. Optimum inhibition efficiency of HCl treated OPEFB powder was 84.38 % at optimum operating conditions. The adsorption of the inhibitor on a mild steel surface is a mixed adsorption involving both physisorption and chemisorption, and obeys Langmuir's adsorption isotherm. Computational studies on xylose, glucose and arabinose, which are present in the inhibitor, suggest strong adsorption interaction between inhibitor compounds and the metal surface.