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The examination, evaluation and comparison of corrosion effect on different metal surface by various crops based biodiesel

Sajan K Chourasia, Absar M Lakdawala and Rajesh N Patel

Abstract

Biodiesel is relatively higher corrosive compared to Diesel; consequently, the concern of viability is now a foremost issue. The biodiesel is self-oxidative in the environment; thus, its characteristics might be changed as fuel. The current work investigates the behavior of numerous biodiesel corresponding to corrosion when exposed to the surface of metal coupons. A gas chromatography mass spectrometry (GC-MS) was performed on eight biodiesel and a hypothesis was proposed to corroborate the hypothesis; static immersion tests, scanning electron microscopic (SEM) and surface roughness analysis were conducted. The immersion test was conducted for 150 days at ambient temperature conditions; later on, the corrosion rate of metals was examined. Results indicate that the Bronze has a maximum corrosion rate of 0.0674 mpy with Karanja biodiesel, followed by palm biodiesel. The Karanja biodiesel has the highest susceptibility to corrosion with all metals, while the Diesel is found to be the lowest with intermediate values for Rapeseed and Castor.

Keywords

Biodiesel, corrosion rate, surface roughness analysis, scanning electron microscopic (SEM) image analysis, gas chromatography mass spectrometry (GC-MS)

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Introduction

The quick exhaustion of crude oil and their massive consumption ultimately leads towards the hunt for reliable substitute fuels.[1] Biodiesel extracted from plants can be a favorable alternative fuel.[2] As a substitute to fossil Diesel, it has to be technically suitable, economically viable, eco-friendly and available in bulk quantity, which it fulfills satisfactorily.[3–5] Inspire of its eco-friendly nature, it also shows superior tribological behavior, which makes it the most superior fuel for lowering engine components wear and friction.[6,7] Yet, the corrosive nature and self-oxidation characteristics of biodiesel seem to be a significant problem.[8–11] These severe problems may degrade the quality of fuel and surface of engine components material whenever directly exposed to biodiesel. The critical factors for the oxidation of biodiesel have been well identified. Biodiesel, when it comes in contact with oxygen at that time, then the oxygen bonds itself convert to a bis-allylic spot that is straight nearby to the two double bonds, which results beginning of autoxidation. During oxidation, biodiesel esters are transformed into various constituents, including organic acids, ketones, alcohols, alkanes, ethers, oligomers and aldehydes, which is undesirable.[12,13]

Therefore, properties of biodiesel, like viscosity, peroxide and acid value increase, while the content of methyl esters and iodine value reduces.[8] Biodiesel contains linolenic, linoleic and oleic acid, which prompt for the creation of peroxide compounds.[14–17] In addition, the hygroscopic behavior of biodiesel results in the formation of free fatty acids from the hydrolysis of biodiesel ester bonds. Neat biodiesel (B100) can't be used straight forward as a fuel in the existing CI engine; therefore without mixing with Diesel will offer some problems.[18,19] A substantial amount of study has been done on the several vital

Mechanical Engineering Department, Nirma University, Ahmedabad, India

Corresponding author:
Rajesh N Patel, Department of Mechanical Engineering, Institute of Technology, Nirma University, Ahmedabad 382 481, India.
Email: rajeshnpatel1969@yahoo.com