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Abstract

Vegetable oils are potential alternative lubricants for the twofold purpose of achieving good tribological properties while protecting the environment. However, any intended use of bio-lubricants in machinery requires of a previous study of their compatibility with the involved sealing materials. In particular, Jatropha oil (JO) is inexpensive and easy to obtain, which make it a good candidate to be used as bio-lubricant in machinery. In this work, a compatibility study of four commercial sealing elastomers, namely, fluoroelastomer (FKM), silicone rubber (VMQ), neoprene/chloroprene (CR), and ethylene-propylene-diene monomer (EPDM) with JO, Engine Motor Oil (EMO) and a blend of EMO and JO (80-20%) (B20), for the purpose of comparison, was conducted. The analyses include the basic measurements comprised in the ASTM-D471 and ASTM-D7216 methods, namely, changes in mass, volume, tensile and tear resistance and hardness. In addition, non-standard measurements of creep compliance, surface morphology and topography, and chemical composition were performed to achieve a deeper evaluation of the interaction of JO with the elastomers. In general, good compatibility was found regarding the standard methods for the four elastomers with JO, being VMQ the most compatible sealing material. However, FKM, CR and EPDM showed changes in the creep compliance modulus and surface morphology when in contact with the three lubricants, which may considerably affect their sealing performance and decrease their useful life. Overall, pure JO generated much less physical changes on the elastomers than EMO and B20, which can be ascribed to the concentrations of free fatty acids contained in JO.

Keywords: Lubrication oil; Elastomer; Seals; Degradation