TRIBOLOGICAL EVALUATION OF MICRO-ALGAE OILS AS GREEN AND SUSTAINABLE ADDITIVES FOR LOW-VISCOSITY LUBRICANTS

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KEYWORDS

Lubricant additives; Wear; Green tribology; Micro-Algae

ABSTRACT

The use of biodegradable oils as additives to produce green lubricants (bio-lubricants) is a current trend for meeting the worldwide environmental care demands. Most biodegradable oils come from oil-rich crops and are chemically treated to enhance their physicochemical properties. Despite this fact, vegetable oils are, in general, considered as not sustainable sources for achieving a massive production of bio-fuels or bio-lubricants without altering the food chain supply [1]. Recently, micro-algae oils have emerged as sustainable alternatives for producing high-value amphipathic lipids for potential bio-lubricants production [2], however, the lubrication performance of these oils is still far from being well established. Hence, this study aims to evaluate the tribological behavior of two different low-viscosity micro-algae oils (MAOs) as lubricating additives for a Group II-mineral oil (Group II). Both MAOs were added in 5 and 10 v/v concentrations, respectively, to Group II. The tribological (CoF and wear) behavior was evaluated by standard four-ball tests, followed by wear scar analyses through SEM. In addition, rheological and thermal stability measurements were conducted for all the oils. Overall, the viscosity of both MAOs/Group II blends was lower than that of Group II. Notwithstanding, MAOs/MO blends generated a reduction of wear and CoF. Thus, the MAOs tested arise as effective additives to reduce wear and CoF without increasing viscosity.

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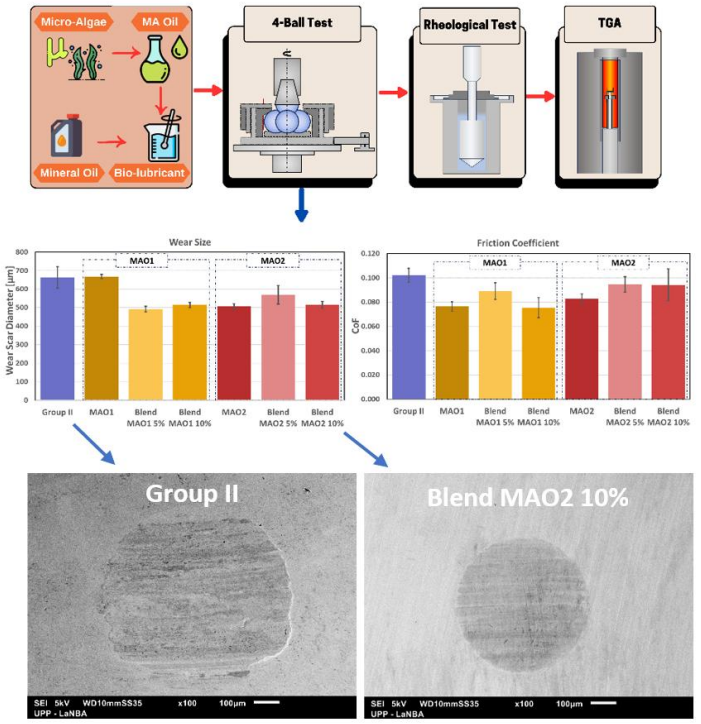

Fig.1 Test procedures and tribological results obtained for the different tested oils and blends.

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