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Synthesis and Tribological Testing of Poly(Methyl Methacrylate) Particles Containing Encapsulated Organic Friction Modifier

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Abstract

The tribological behaviour of polymer particles containing an encapsulated, organic friction modifier (FM) is presented. Particles comprising of a poly(methyl methacrylate) (PMMA) shall and a methanol core, into which FM was dissolved, were produced via a dispersion polymerisation producing a core-shell morphology. The inclusion of these particles dramatically increased the overall concentration of FM which could be blended into dodecane.

The tribological behaviour of the particles produced, both with and without encapsulated FM, was tribologically tested in pure dodecane.

The addition of as little as 1.5 wt% particles was found to decrease the friction coefficient and measured wear volumes below those for dodecane saturated with FM. Data suggests that the FM delivery method may be dominated by a bursting mechanism.

Keywords
Boundary; Lubricant Additives; Particles

1. Introduction

In a passenger car as much as 28% of the energy produced by a tank of fuel is used in overcoming frictional forces within the engine [1], with as little as 12% of the total energy being used to drive the wheels [2-4]. Pressure to increase fuel economy, reduce engine emissions, and increase the lifetime of engine parts has been growing over recent years and this has driven the development of new engine technologies and lubricants [2, 5]. In order to optimise the lubricating performance of engine oils, and to allow engines to perform to the best of their ability, different chemical additives are blended into the oil. These additives can