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Ultrasonic Motor Performance Influenced by Lubricant Properties

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Abstract

Functional lubrication has been shown to be a promising method for improving the performance of ultrasonic motors (USMs). However, the complex lubrication mechanisms have not been studied and the effect of the lubricant properties on motor performance remains unknown. In this paper, both low-traction fluids and high-traction fluids with a wide viscosity range are applied, and the lubricating effects are investigated in hybrid transducer-type ultrasonic motors. The results clearly show that high-traction fluids have significant superiority to low-traction fluids in terms of motor efficiency and reduction of friction loss at the entire range of the applied preload. A high friction coefficient in boundary lubrication regime and efficient modulation in friction are confirmed to be essential for achieving high-performance lubricated USMs. It is also found that the motor performance is independent of lubricant viscosities in the tested range, irrespective of lubricant types. The reasons for the distinct lubricating effects with the two types of lubricants are analyzed in

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