

Lubricants, materials and methods of lubrication for MEMS

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要旨

Microsystems such as MEMS have excellent potential for technology-led industrial developments especially in fields such as micro-bio-devices, robotics, RF MEMS, optical switches, optical display, energy harvesting, miniaturization of machines etc. Despite very early developments in MEMS, some problems related to materials and surfaces (tribology) have remained which threaten to slow down further innovations and applications in this area.

In this presentation, we will review the challenges faced with regards to materials and tribology for micro-electro-mechanical systems. Primary focus of the talk will be on the tribological issues such as stiction, dynamic friction and wear of Si- and polymer-based materials, and how these problems have been tackled in our research. We will introduce solutions that are based on self-assembled monolayers, polymeric composite coatings and nano-lubrication for eliminating stiction, reducing friction and increasing wear life by several orders of magnitude. We will also present a novel method of delivering lubricants to extremely small spaces such as few micrometer gaps between side walls of a MEMS device. An integrated approach to materials and tribology would ultimately facilitate MEMS that are easy to fabricate and durable for long-term reliability.

