Fraunhofer KIT Karlsruher Institut für Technologie
MIKROTRIBOLOGIE CENTRUM µTC

IAM Institute for Applied Materials

MASTER'S THESIS

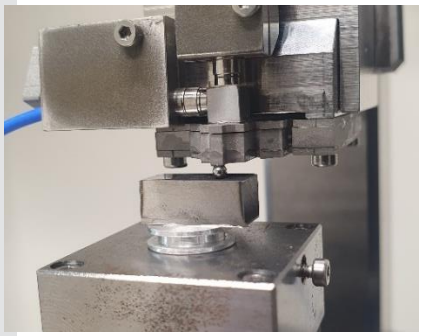
Development of a "fluidfree" solid lubrication mechanism for rolling bearings

Background

A ''*fluidfree*'' lubrication mechanism for rolling bearings has long challenged tribologists, since the conventional liquid lubricants tend to fail under high temperatures or loads and in vacuum. Several solid lubricants have sparked the interest of many experts in the field of friction and wear research due to their stability and favorable tribological properties. Among these solid lubricants, graphite is a rather peculiar option for its good lubricating behavior and stability. In the quest of extending the lifetime of the advantageous lubricating properties of graphite, binders can be used. The use of phenolic resin as a binder was reported to exhibit low friction and wear at a wide range of temperatures, as well as a successful transfer of graphite to the counter surface, thus, ensuring a long-term lubrication.

Objectives

During the course of this thesis you **will identify the optimal graphite-resin ratio** to elaborate lubricating pins for a rolling bearing. You **will prepare**, *in collaboration with the institute for Product Development (IPEK),* **lubricating pins with different compositions** using a self-built hot press, also determine the frictional behavior on a constructed equipment. You are expected **to characterize the wear tracks** using a confocal microscope (potentially scanning electron microscope) and analyze them in conjunction with the measured friction. Hence, unveiling the lubrication and wear mechanisms of the synthesized pins, notably, the transfer film formation within the contact area.



Load adjustable ball-on-flat tribometer

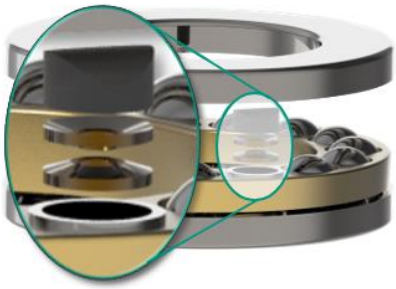
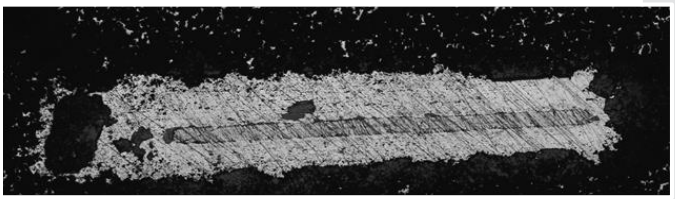


Image of the desired graphite pin in a rolling bearing



Confocal image of the wear tracks after friction test showing the lubricating transfer film formation.

Requirements

Student in the fields of physics, mechanical engineering, materials science or chemistry. Previous knowledge in the field of tribology is not necessary. Demonstrating a large scientific curiosity, as well as interest in hands-on lab work. Knowledge about surface characterization is advantage but can be acquired during the course of this project and additionally Python skills are an asset.
Possible start: as soon as possible

Contact

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