Fraunhofer KIT Karlsruher Institut für Technologie
MIKROTRIBOLOGIE CENTRUM µTC

IAM Institute for Applied Materials

MASTER'S THESIS

Development and Characterization of VC/Si/Amorphous Carbon Nanocomposite Coatings for Enhanced Tribological Performance

Background

Vanadium carbide (VC) combined with amorphous carbon (a-C) forms nanocomposite coatings valued for their hardness, wear resistance, and low friction, largely due to carbon-rich tribofilms formed during sliding. Magnetron sputtered VC/a-C coatings consist of nanocrystalline VC in an amorphous carbon matrix, with properties dependent on composition. Adding silicon to the amorphous carbon may create silicon carbide (SiC) or silicon-containing nanocomposites, potentially improving mechanical and tribological performance at high temperatures. However, the effects of silicon incorporation on the structure and tribological behaviour of these nanocomposites require experimental study.

Tasks

The aim of the project is to study the high-temperature tribological behaviour of VC/Si/a-C nanocomposite coatings deposited by magnetron sputtering. Tribological experiments will be carried out on coated cemented carbide substrates. XPS and Raman spectrometry will be used to investigate the extent of graphitisation at high-temperature tribological tests and its influence on the tribological behaviour.

Requirements

Students from the fields of physics, materials science, mechanical engineering, or similar, with a strong interest in experimental work.
Prior knowledge in tribology is not necessarily required. The most important qualities are careful and independent work in the laboratory.

Possible start: Immediately.

Contact

Dr. Johannes Schneider
Institute for Applied Materials(IAM-ZM)
E-Mail: johannes.scheider@kit.edu
Telefon: +49 721 608 41460

Dr. Amod kashyap.
Institute for Applied Materials(IAM-ZM)
E-Mail: amod.kashyap@kit.edu
Telefon: +49 721 608 48509