Design of multifunctional lubricant additives for extreme environments
King Abdullah University of Science and Technology (KAUST)

Job Title	Design of multifunctional lubricant additives for extreme environments
Department	Clean Combustion Research Center (CCRC) http://ccrc.kaust.edu.sa
Institution	King Abdullah University of Science and Technology (KAUST) Thuwal, , Saudi Arabia
Date Posted	Sep. 24, 2019
Application Deadline	Open until filles
Position Start Date	Available immediately
Job Categories	Post-Doc
Academic Field(s)	Mechanical Engineering Chemical/Petroleum
Apply By Email	mani.sarathy@kaust.edu.sa

Job Description

Automotive manufacturers are continually endeavoring to improve the performance and efficiency of internal combustion (IC) engines and more importantly reduce fuel consumption and emissions. The push to achieve these targets has shifted the environment in IC engines to harsher conditions by: gasoline direction injection (GDI), exhaust gas recirculation, turbocharging, etc. Improvements in IC engines cannot achieve better fuel economy and durability without a concerted effort to develop improved lubricants. The lubricant oil and additive technology have seen limited improvements in recent decades. Although formulations have improved, their underlying chemistry has remained largely the same, and conventional lubricants were not designed according to newly adopted coatings and more extreme conditions: high temperature and pressure in IC engines. The lubricant additive functionalities: friction modifier, viscosity improver, dispersant, and antioxidant should be redesigned meet current challenges. This timeline of this industrial project will be three year, collaborating with companies to design a multifunctional lubricant additive for the next-generation IC engine. Our aim is to

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study fundamental tribochemical reactions together with advanced molecular dynamics simulations, surface chemistry analysis, and concerted robust screening/testing procedures, thereby providing a pathway to high performance lubricants.

Profile of the candidates
• You hold a PhD degree in Mechanical, Physical or Chemical engineering from top-tier research institutes.
• You have a strong motivation for conducting scientific research at a high level.
• You possess good analytical, and technical skills
• You have a great record in publications

Track 1 (Fundamental tribochemical reactions)
• Experience with bench tests for developing new lubricant additives
• You have knowledge and experience with surface analysis tools, such as STEMEDX, high-resolution TEM, FIB, XPS, and AFM
• Experience with Mechanochemical Reactions is an asset
• Your job will be developing the fundamental tribochemical reaction mechanisms, in which advance experimental techniques is used to
• Study in-situ mechanochemical reactions under molecular level for Boundary Lubrication (BL) and Elastohydrodynamic Lubrication (EHL)
• Understand chemical interactions between fuel and lubricant under extreme environments as IC engine: high pressure, temperature, and ultrahigh shear stress and shear rate conditions

Track 2 (molecular dynamic simulations)
• You are advance in computational mathematics and Advanced Scientific Computing.
• Experience with programming in C++, Matlab, Python or equivalent is an advantage.
• You have knowledge and experience with Molecular Dynamics (LAMMPS)
• Experience with Computational Fluid Dynamics is an asset.
• Your job will consist of developing a Multiscale Modelling framework, in which non-equilibrium Molecular Dynamics is exploited to
• Derive appropriate constitutive relations that can be used in continuum simulation techniques for Boundary Lubrication (BL) and Elastohydrodynamic Lubrication (EHL)
• Smart automated coupling of BL and EHL solvers, to the MD solver for the atomistic description of local lubricant properties, near-wall effects, molecular layering, mechanochemistry etc.

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Contact Information

Please reference Academickeys in your cover letter when applying for or inquiring about this job announcement.

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