THE UNIVERSITY OF HONG KONG

DEPARTMENT OF MECHANICAL ENGINEERING

SEMINAR

Online

Title: **Hydrogen Embrittlement study of Advanced D&P Steels**

Speaker: **Mr. Yuxuan Liu (PhD candidate)**
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Date: **16 April, 2021 (Friday)**

Time: **3:30 p.m.**

Zoom Link: **1) Link to join the meeting:**

https://hku.zoom.us/j/7862831227?pwd=TlhHU20rQ2tzZFFVMEZmU1lHUTBJdz09

2) Meeting ID: 786 283 1227

3) Password: pDkT71

Abstract:
Nowadays, steady growth of the automotive industry brings us issues in power source and environment, such as fossil fuel shortage and greenhouse effect. To alleviate these problems, developing lightweight materials is an effective way, while safety should also be taken into consideration. Novel Deformation & Partition (D&P) steels were recently reported to exhibit excellent combination of strength, ductility and toughness, indicating promising lightweight applications and safety in automobile and other industries. D&P steels compose of very unique microstructures including homogeneous nano carbides in martensite matrix, alternative lamellar of martensite and retained austenite with manganese segregating at prior austenite grain boundaries, and high

density dislocations in both phases, which collaboratively contribute to the excellent mechanical properties. However, before D&P steels can be used in real products, a critical issue, namely the Hydrogen Embrittlement (HE) which arises more severely with higher strength, should be addressed. HE refers to failure caused by diffused hydrogen and relates to microstructures and local stresses. How hydrogen atoms diffuse or reside in steels and what they do to cracks are two main questions.

In this study, the HE resistance of D&P steels will be investigated by slow strain rate tensile test before and after hydrogen charging. The hydrogen diffusion coefficient and content will be determined using thermal desorption spectroscopy and the trap site density will be determined by hydrogen permeation test. Sophisticated characterizations, including SEM, EBSD and TEM, will be performed to study the crack nucleation and propagation, which will help to reveal the roles different microstructures play. With better understanding of the HE mechanisms, novel design of low-HE risk or HE-free advanced D&P steels will be proposed.

In this talk, a brief introduction of fundamentals on D&P steels and HE will be given, and some preliminary results will be presented.

ALL INTERESTED ARE WELCOME

For further information, please contact Prof. M.X. Huang at 3917 7906.

Research area: Advanced Materials