High-/Medium-Entropy Alloys and Wear-Resistant Coatings for Extreme Tribocorrosion Environments

报告时间：2026 年 7 月 2 日 9：00-10：00

报告地点：机电工程学院 A507

主办单位：机电工程学院

报告人简介： Guijiang Diao is a Research Scientist and Postdoctoral Fellow at the University of Alberta, working under the supervision of Prof. Dongyang Li, a Fellow of the Canadian Academy of Engineering. He specializes in high- and medium-entropy alloys, lightweight Al-based medium-entropy alloys, and advanced wear-resistant coatings for extreme environments. His work focuses on the critical role of matrix–reinforcement chemical compatibility in microstructural evolution, as well as composition-driven regulation of mechanical properties and corrosion–wear synergistic behavior. He pioneered a strategy for transforming brittle Al_3Ti into a ductile and thermally stable lightweight medium-entropy alloy, and developed a cost-effective hard coating featuring columnar Cr_2B phases integrated with a dispersed carbide network. As a core researcher, he has contributed to major NSERC and industry-sponsored projects, including high-entropy alloys for small modular reactors and ML/DFT-assisted materials design. He has published more than ten first-author papers in leading journals such as Acta Materialia and Wear, and has delivered multiple oral presentations at the Wear of Materials (WOM) conference. These achievements demonstrate his strong expertise and promising potential in advancing wear-resistant materials and high- and medium-entropy alloy technologies.

报告内容简介：

To address the premature failure of flow components in the energy and chemical industries under combined abrasive, adhesive, and corrosive wear, this report establishes a design paradigm for high- and medium-entropy alloys and coatings through the sequence of “composition design → microstructure control → strength–toughness synergy → tribocorrosion enhancement.” It highlights interstitial alloying and in situ carbide formation in Ni-, Fe-, and AlCrFeNi(Ti)-based systems to regulate FCC, L21, A2, and B2 phase constituents as well as nanoprecipitates, thereby alleviating the trade-offs among strength, toughness, and wear resistance. Lightweight Al3Ti-based high- and medium-entropy alloys enabled by the D022-to-L12 structural transformation are shown to possess enhanced thermomechanical stability. In addition, a Cr2B-reinforced coating strategy is proposed to balance wear resistance and cost, together with evaluation protocols for corrosion–wear synergistic behavior. By integrating electron work function criteria with multiscale characterization, this work bridges laboratory-scale synthesis and industrial application, providing guidance for material selection and design in extreme service environments.

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