Projects, Objectives, and Research Efforts

Molecular and Nano- Catalysts

Projects	Objectives	Research Efforts	Researchers
Project 1: Bio-inspired molecular catalysts for fuel and energy generation	Develop bioinspired molecular systems for alternative lower cost and more energy efficient pathways	• Develop novel biocatalysts and biomimetic catalysts for H_2-activation and CO_2-reduction • Develop bio-inspired molecular catalysts for photosynthetic water-splitting	S. Ogo K-S. Yoon T. Matsumoto T. Yatabe T. Uchida T. Koide
Project 2: Nanomaterials & nanodevices designed for efficient energy & materials conversion	Develop nanocatalysts for efficient oxidation and production of energy materials Develop nanodevices for active utilization of photon energy based on charge separation at the nanointerface	• Develop selective electrooxidation catalysts • Develop efficient reduction catalysts • Develop efficient photo reduction catalysts	M. Yamauchi Y. Takahashi T. Fukushima T. Noguchi C. Xuedong N. Nakashima M. Isegawa

Projects, Objectives, and Research Efforts

Structural materials

Projects	Objectives	Research Efforts	Researchers
Project 3: Predictive Models of H_2 - Assisted Cracking	• Develop physics-informed, predictive models of H_2-assisted cracking in structural materials for technologically relevant loading conditions and temperatures • Develop predictive models for the mitigation of H_2-assisted cracking through deactivation of catalytic surfaces	• Establish comprehensive physical descriptions of H_2-assisted cracking at the proper size scales • Establish relevant constitutive relationships for deformation in H_2-exposed materials • Integrate physical descriptions and constitutive relationships into predictive model framework	M. Kubota B. Somerday H. Matsunaga R. Komoda, T. Tsuchiyama R. Kirchheim P. Sofronis A. Nagao
Project 4: Material Development for H_2 Service	• Design cost-competitive materials for performance in H_2 service	• Develop higher-strength, hydrogen-compatible steels through advanced material processing methods • Characterize and improve hydrogen compatibility of welds	T. Tsuchiyama B. Somerday M. Kubota H. Matsunaga A. Macadre T. Masumura
Project 5: Low friction and wear technology by control of tribo-interfaces	• Develop physics-based, comprehensive predictive models to design tribological systems with super low friction and wear in order to improve energy efficiency of machinery across technology sectors	• Establish comprehensive description of mechanical and tribo-chemical processes and their changes at tribo-interface	J. Sugimura Y. Sawae H. Tanaka K. Yagi T. Morita T. Yamaguchi