



Dr. Gao-Feng HAN

Department of Energy Engineering,
Center for Dimension-Controllable
Organic Frameworks, **UNIST**

Low temperature conversion of alcohols into bulky nanoporous graphene and pure hydrogen

May 21 | Bldg. 101
Tuesday, 4 PM | Seminar Room on the 1st floor

Abstract:

The direct conversion of biorenewable alcohols into value-added graphene and pure hydrogen (H₂) at benign conditions is an important challenge, especially, considering the open carbon-reduced cycle. In this study, we demonstrate that inexpensive calcium oxide (CaO, from eggshell) can transform alcohols into bulky nanoporous graphene and pure hydrogen (~99%) with robust selectivity at the temperature as low as 500°C. Consequently, the growth of graphene can follow the direction of alcohol flow, and uniformly penetrates into bulky nanoporous CaO platelets longer than 1 m without clogging. Experimental results and DFT calculations demonstrate that alcohol molecules can be catalytically carbonized on the surface of CaO at low temperature. The concept on the comprehensive utilization of biomass-derived alcohols offers a carbon-negative cycle for mitigating the global warming and energy demand.

References:

[1] Gao-Feng Han, Jong-Beom Baek, *et. al.*, **Adv Mater** 31, 1807267 (2019)

Education/work Experience:

[1] Ph.D., Sep. 2010 — Dec. 2015, major in Materials Science, Department of Materials Science and Engineering, **Jilin University**, Changchun, P.R. China, Advisor: **Qing Jiang**
[2] Postdoc, Jul. 2016 — Department of Energy Engineering/Center for Dimension-Controllable Organic Frameworks, **Ulsan National Institute of Science and Technology (UNIST)**, Korea, Principal investigator: Prof. **Jong-Beom Baek**

Dr. Gao-Feng Han present interests focus on small molecular transition reactions, which include alcohol decomposition, dinitrogen dissociation at low temperature, ammonia synthesis at ambient conditions, and methane synthesis.

You are cordially invited to attend!

Tuesday Colloquium