Seminar Series on Materials Chemistry

SS2022

Thursday June 23rd, 2022

14h00, HS2

Mini-symposium: Heterogeneous Catalysis

Development of an Olefin Interconversion Catalyst

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Propylene is an essential building block for manufacturing a wide range of daily supplies and industrial products. The ethylene-to-propylene (ETP) process is attractive as an alternative method for producing propylene in regions suffering from a supply-demand imbalance between light olefins. The continued expansion of shale gas-based production by ethane crackers in the U.S. means that ethylene has begun to be oversupplied in North America. Therefore, there has been strong demand for a technology to produce propylene that has a simple process and high yield using an ethylene-rich feed in connection with the ethane cracker. Moreover, as the transportation industry rapidly converts from liquid hydrocarbon fuel to electricity, excess bio-ethanol will appear on the market at a competitive price. The ETP process, combined with the ethanol dehydration process could be one of the simple and renewable pathways to produce bio-based propylene from bio-ethanol. Here, I will talk about R&D approach in KRICT for the development heterogeneous ETP catalyst materials and bench-scale process for future commercialization (TRL 3 ~ 5).

Photo- and electrochemical approaches for chemical conversion of waste substrates

Dr. Christian Pichler
Senior Researcher at CEST Wiener Neustadt and "Habilitant" at the Institute of Applied Physics, TU Vienna

Currently, the chemical industry is completely dependent on the utilization of fossil resources. To reduce this dependence and minimize the associated CO2 emissions, novel resources and processes are necessary to produce chemical products. Possible substituents can be biomass or waste

substrates, which would also be beneficial, considering the principles of circular economy. To convert these complex substrates into chemicals, photo- and electrochemical approaches, are especially appealing, as only a negligible amount of CO2 is emitted, if these processes are driven by renewable electricity. A big challenge for photo/electrochemical conversions of biomass or wastes is to make these complex, insoluble substrates accessible for the actual conversions. Unconventional reaction media, such as metal salt hydrates, or targeted pretreatment steps (chemical or biochemical) can be utilized to initially breakdown the complex substrates in soluble compounds before converting them photo- or electrochemically. Different examples for these combined approaches shall be presented, where biomass, plastic or food waste could be converted in integrated two step processes into valuable chemical products such as formic acid or ethylene. Mechanistic details regarding the involved reactions could be unraveled by applying electroanalytical and spectroscopic techniques as well as quantum chemical calculations. These waste to chemical conversions, could offer appealing novel routes for chemical industry and provide essential base chemicals in a sustainable manner.