Catalysis Center for Energy Innovation

GUEST SEMINAR SPEAKER

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2:00 PM ▪ 322 ISE Lab

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Biography: Kevin Van Geem (associate professor) is member of the Laboratory for Chemical Technology of Ghent University. Thermochemical reaction engineering in general and in particular the transition from fossil to renewable resources are his main research interests. He is a former Fulbright Research Scholar of MIT and directs the Pilot plant for steam cracking and pyrolysis. He is the author of more than hundred scientific publications and has recently started his own spin-off company. He is involved in on-line and off-line analysis of complex petrochemical and biochemical samples using comprehensive two-dimensional gas chromatography. Pyrolysis, detailed kinetic modeling, process, scale-up, modeling, and ant-fouling technology belong to his main expertise.

"Process intensification by first principles based reaction engineering: from theory to practice"

Abstract: The European Commission, but also many other public and private organizations, believe that biomass for fuels and chemicals production will play a crucial role in meeting Europe's "202020" targets. Among the main biomass conversion technologies (combustion, gasification, pyrolysis) only pyrolysis converts biomass to high energy density liquids (bio-oil) at high yields and, hence, is the most suitable to fulfil the high future demands for biofuels and biochemicals. However, the presently available reactor technology for fast pyrolysis is far from optimal. Most fast pyrolysis reactor designs have not survived the pilot plant stage apart from the rare exception. Only the entrained flow bed reactor and the rotating cone reactor have been commercialized on a small scale. In this presentation, the focus is on the first principles based design of a new reactor type known as the rotating bed reactor in a static geometry (RBR-SG). In the Laboratory for chemical Technology we are currently demonstrating this new disruptive technology for the conversion of biomass to chemicals and fuels via fast pyrolysis based on this innovative reactor concept. In our integrated approach of the problem, besides reactor engineering, kinetic modelling, Computational Fluid Dynamics, focus is given, on one hand, on the genetic modification of plants to optimise liquids yields and, on the other, on the further purification, fractionation and extraction of valuable compounds from these liquid products. On-line analysis using comprehensive 2D GC and Time of Flight Mass Spectrometry play an essential role to close mass balances and obtain accurate data.

1. Vanneste, J.; Van Gerven, T.; Vander Putten, E.; Van der Bruggen, B.; Helsen, L., Energetic valorization of wood waste: Estimation of the reduction in CO2 emissions. Science of The Total Environment 2011, 409, (19), 3595-3602.

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