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ΘΕΜΑ: **Principles and challenges of carbon dioxide methanation**

ΤΟΠΟΣ: Αίθουσα Σεμιναρίων ITE/IEXMH

ΗΜΕΡΟΜΗΝΙΑ: **Πέμπτη, 11 Απριλίου 2019**

ΩΡΑ: **12:30**

ΠΕΡΙΛΗΨΗ

Global warming is widely perceived as the effect of increased carbon dioxide emission due to the massive consumption of fossil fuels. CO_2 is also formed as result of biomass transformation, and can be found in the side streams of biorefineries or biogas. Methanation of captured CO_2 can be regarded as efficient and environmental friendly method of its utilization and biogas upgrading. A lot of research studies on the application of noble and non-noble, mainly nickel catalysts has been carried out in the recent years. A better understanding of the reaction mechanism, the development of active and durable catalysts, through the modification of support composition and metal loading, changes of the structural and surface properties, leading to the increase of activity and selectivity at low temperatures, improvement of catalysts resistance for sintering, carbon deposit formation, poisoning with sulfur compounds as well as development of new reactor concepts of enhanced mass and heat transfer is of paramount importance. The lecture will be devoted to the fundamental principles and challenges of CO_2 hydrogenation to methane. The bases of CO_2 reaction thermodynamics and mechanism, as well as achievements in the field of catalyst development will be discussed.

Σύντομο βιογραφικό σημείωμα

Dr hab. Wojciech Gac, Professor, University of Maria Curie-Sklodowska (UMCS), was born in Poland in 1967. He graduated from UMCS in Lublin in 1992. He received his Ph.D. in chemistry (1996) from the UMCS and his habilitation degree in 2012. He has been working at UMCS, Faculty of Chemistry, Department of Chemical Technology since 1996. His research activity has been focused on the synthesis and characterization of heterogeneous catalysts and nanostructured materials, mainly for the production and utilization of hydrogen, reforming of methane, conversion of methanol and ethanol, hydrogenation of carbon oxides and oxidation of CO and CH4. He has extensive experience in studies of materials by temperature-programmed methods and FTIR techniques. He has published over 60 articles in national and international journals and books. He was scientific coordinator and participant of national and international research projects, including "Development of an Innovative Concept for Carbon Dioxide Utilization as Side Stream of Integrated Bio-refinery Concepts" (ICOCAD) - ERA-NET Bioenergy project (2016-2018), "Development of a Portable Internal Reforming Methanol High Temperature PEM Fuel Cell System" - FCH-JU FP7 2013-2016. He is an experienced university teacher for students of chemistry in chemical technology, materials chemistry, courses in chemical engineering, applied chemistry and renewable energy sources. He has also experience in the application and management of research infrastructure projects.

Selected recent publications

1. W. Gac, W. Zawadzki, M. Rotko, G. Słowik, m. Greluk, CO2 methanation in the presence of Ce-promoted alumina supported nickel catalysts: H2S deactivation studies, Top Catal (2019). https://doi.org/10.1007/s11244-019-01148-3
2. W. Gac, M. Greluk, G. Słowik, Y. Millot, L. Valentin, S. Dzwigaj, Effects of dealumination on the performance of Ni-containing BEA catalysts in bioethanol steam reforming, Appl. Catal. B 237 (2018) 94–109.
3. W. Gac, W. Zawadzki, G. Słowik, A. Sienkiewicz, A. Kierys, Nickel catalysts supported on silica microspheres for CO2 methanation, Micropor. Mesopor. Mater. 272 (2018) 79-91.
4. W. Gac, M. Greluk, G. Słowik, S. Turczyniak-Surdacka, Structural and surface changes of cobalt modified manganese oxide during activation and ethanol steam reforming reaction, Appl. Surf. Sci. 440 (2018) 1047-1062.
5. W. Gac. T. Borowiecki, P. Kowalik, Nickel nanocatalysts for methane steam reforming, in Nanontechnology in Catalysis (Eds. B. Sels, M. Van de Voorde), Viley-Vch, Verlag GmbH& Co KGaA, 2017. pp. 401-419.