



POLISH NATIONAL AGENCY  
FOR ACADEMIC EXCHANGE



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PROGRAMME

<b>name of the unit:</b> <b>FACULTY OF CHEMISTRY</b> Institute of General and Ecological Chemistry, Lodz University of Technology		<b>symbol:</b> <b>I-31</b> <a href="http://www.chemia.p.lodz.pl">http://www.chemia.p.lodz.pl</a>
<b>head of the unit:</b> Prof. Małgorzata I. Szyrkowska-Jóźwik, PhD, DSc	<b>potential promoters:</b> Paweł Mierczyński, PhD, DSc, TUL Prof. Prof. Małgorzata I. Szyrkowska-Jóźwik, PhD, DSc	<b>contact person:</b> Paweł Mierczyński, PhD, DSc, TUL Prof. phone: 42-631-31-25 <a href="mailto:pawel.mierczynski@p.lodz.pl">pawel.mierczynski@p.lodz.pl</a>
<b>scope of activities:</b> The main areas of research interest can be listed as follows: Fisher-Tropsch synthesis; Research on catalytic conversion of compounds obtained from biomass; Catalytic hydrocracking of hydrocarbons; Production of biodiesel; Bio-jet fuel production; Hydrogen production by reforming of various raw materials (alcohols, natural gas, LNG); Synthesis of methanol and higher alcohols; Gasification of biomass; Hydroconversion of waste paraffins into liquid hydrocarbon fractions; Production of nanomaterials; Synthesis of new materials with potential industrial application; Research on the morphology of catalysts and functional materials; Investigation of the chemical composition of the surface of solids and physicochemical properties using a variety of research techniques (ASA, SEM-EDS, ToF-SIMS, FTIR, XRD, ICP-AES, TPR, TPO, TPD, BET); Synthesis of catalysts and functional materials; Study of the mechanisms of catalytic reactions carried out in the gas phase; Analysis of biofuels and chemical compounds obtained from biomass using chromatographic methods.		<b>graphic material</b>  
<b>present activities:</b> We are currently conducting investigations related to the development of modern, highly active and selective heterogeneous catalysts for the transesterification of triglycerides to fatty acid methyl esters, the Fisher-Tropsch process and the reforming process of natural gas or methanol towards hydrogen production. Within this research topics we prepare mono- and bimetallic catalysts supported on mixed oxides, zeolites or carbon nanotubes. As part of this research plan, it is planned to determine the influence of metallic or structural promoters on the physicochemical and catalytic properties of the supported catalysts in the tested reactions. It is also planned to investigate the influence of the pre-treatment and activation conditions of the catalytic material on their activity and selectivity in the selected processes, the size of the specific surface area of the tested catalytic systems and their phase composition. Achieving the main research goals is connected with finding a correlation between the physicochemical properties of heterogeneous catalysts and their catalytic behaviour in the studied processes.		
<b>Future activities:</b> Preparation of nanomaterials with specific physical and chemical properties; Analysis of fuels and biofuels composition; Development of new energy production technologies; Optimization of catalyst composition for selected catalytic processes; Determination of reaction mechanisms carried out in the gas phase;		
<b>Publications:</b> <ul style="list-style-type: none"><li>• Pawel Mierczynski, Magdalena Mosinska, Waldemar Maniukiewicz, Krasimir Vasilev, Malgorzata I. Szyrkowska Jozwik „Oxy - steam reforming of liquefied natural gas (LNG) on mono- and bimetallic (Ag, Pt, Pd or Ru)/Ni catalysts” Catalysts 2021, 11(11), 1401.</li><li>• P. Mierczynski, B. Dawid, K. Chalupka, W. Maniukiewicz, I. Witonska, K. Vasilev, M.I. Szyrkowska, „Comparative studies of Fischer-tropsch synthesis on iron catalysts supported on Al<sub>2</sub>O<sub>3</sub>-Cr<sub>2</sub>O<sub>3</sub> (2:1), multi-walled carbon nanotubes or BEA zeolite systems” Catalysts 9(7), (2019) 605.</li></ul>		



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- A. Mierczynska, P. Mierczynski, W. Maniukiewicz, R.M. Visalakshan, K. Vasilev, P.A. Smith „Magnetic separation technology: Functional group efficiency in the removal of haze-forming proteins from wines” *Food Chemistry* 275 (2019) 154.
- P. Mierczynski, M. Mosinska, N. Stepinska, K. Chalupka, M. Nowosielska, W. Maniukiewicz, J. Rogowski, N. Goswami, K. Vasilev, M. I. Szynkowska „Effect of the support composition on catalytic and physicochemical properties of Ni catalysts in oxy-steam reforming of methane” *Catalysis Today* 364 (2021) 46.

**Research projects:**

- „Hydrogen production by reforming of liquefied natural gas over modern bimetallic catalysts supported on complex binary oxide systems - OPUS 15 – National Science Center - 2018/29/B/ST8/01317 ID: 411180
- „Modern Au-Cu / CNT, Au-Ni / CNT catalysts for oxy-steam reforming of methanol” - Sonata 3 - National Science Center - 2012/05/D/ST8/02856 ID: 191499
- „Production of hydrogen by oxy-steam reforming of methanol on complex bimetallic catalytic systems” – Iuventus Plus – MNiSW - IP2014 030573 ID: 253150

**keywords:**

hydrogen, production of biodiesel, heterogeneous catalysts, nanomaterials, synthesis gas, reforming of alcohols and hydrocarbons, LNG, natural gas, nanomaterial synthesis, monometallic and bimetallic catalysts, alloys, CVD, biofuel, Bio-jet fuel.

**List of internship proposal in this research team:**

- Studies of the physicochemical and catalytic properties of the heterogeneous catalysts
- Synthesis and modification of catalytic materials and nanomaterials