

PROPOSALS

for cooperation

**of Integrated Technologies, Processes
and Apparatuses department of
NTU “KhPI”**

Department of Integrated Technologies, Processes and Apparatuses

- **HEAD OF DEPARTMENT**

Leonid L. Tovazhnyansky, Doctor of Technical Sciences, Professor

- **Deputy Head of Department**

Valeriy E. Ved', Doctor of Technical Sciences, Professor

valeriy.e.ved@gmail.com

- **Specialties and specializations of student training:**

Computer-integrated technological processes and productions

- **Scientific Activities:**

- processes of heat and mass transfer in two-phase systems
- integration processes (pinch analysis)
- ceramic composite materials
- catalytic purification of exhaust gases
- diffusive carbide surface alloying

Catalytic Purification of Exhaust Gases

Catalytic Purification of Exhaust Gases

Results and Achievements

Published studies

- Tovazhnyanskii L.L., Ved' V.E., Koshchii V.A., Rovenskii A.I., Meshalkin V.P., Krasnokutskii E.V., 2011, Effectiveness of Operation of Sewerage System of Mobile Complex of Thermocatalytic Waste Treatment, Theoretical Foundations of Chemical Engineering, 45, 6, 838-841, DOI: 10.1134/S0040579511060169.
- Tovaznyanskii L.L., Ved V.E., Koshchii V.A., Krasnokutskiy Ye.V., 2012. Modeling of conversion processing of harmful exhaust gases of internal combustion engines. CAPE Forum 2012. Computer Aided Process Engineering. Book of Abstracts, 26-28 March 2012. University Of Pannonia, Veszprem.
- Krasnokutskii E.V., Ved V.E., 2013, Substantiating Reaction Mechanism of Thermocatalytic Benzene Conversion, Theoretical Foundations of Chemical Engineering, 47, 1, 60-65, DOI: 10.1134/S004057951301003X.
- Tovazhnyanskii L.L., Ved' V.E., Koshchii V.A., Rovenskii A.I., Krasnokutskii E.V., 2013, Mobile Thermocatalytic Waste Processing Complex, Chemical Engineering Transactions, 35, 907-912, DOI: 10.3303/CET1335151.
- Krasnokutskiy Ye., Ved V., Kuznetsova M., 2015. Modelling of Effective Thickness of the Catalyst Support Porous Layer. CAPE Forum 2015. Computer Aided Process Engineering. Book of Abstracts, 27-29 April 2015. University of Paderborn. Paderborn.

Catalytic Purification of Exhaust Gases

Results and Achievements

Submitted for publication

- Evgeny V. Krasnokutskiy, Bekzat B. Makhanov, Valery E. Ved', Marat I. Satayev, Anna V. Ponomarenko, Abdilla A. Saipov, 2016. Universal Multi-Functional Secondary Catalyst Carriers for Purification of Gas Emission of Thermal Power Equipments, Chemical Engineering Transactions, Vol. 52 – PRES 2016.
- Valery E. Ved', Evgeny V. Krasnokutskiy, Marat I. Satayev, Alena V. Ved', Abdilla A. Saipov, 2016. Calculation of the Operation Parameters of the Catalytic Converters of the Harmful Gas Impurities, Chemical Engineering Transactions, Vol. 52 – PRES 2016.

Proposal for collaboration

- **Objectives**

- Development of method and theoretical substantiation of synthesis of erosion-resistant and high adhesive glass-crystalline films on the surface of metals and their oxides.
- Development of method and theoretical substantiation of synthesis of erosion-resistant catalytically active coatings on glass-crystalline carrier.
- Research of features of heterogeneous catalytic conversion of gas emissions of thermal power plants on the developed catalytic coatings.
- Development of the mathematical description of the heterogeneous catalytic conversion process of gas emissions on the developed catalytic coatings, research of ways of intensification of gas emission purification process.

- **Expected results**

- Theoretical basis and method of synthesis erosion resistant and high-adhesive glass-crystalline coatings on metals and their oxides.
- Theoretical basis and method of synthesis erosion resistant catalytically active coatings on glass-crystalline carrier.
- Solution of the optimization of quality and quantity composition of glass-crystalline coating and catalyst layer to improve their erosion resistance and catalytic activity in given operating conditions.
- Design and manufacture of prototype of catalytic gas emissions unit.

Proposal for collaboration

- **Scientific novelty**

- The development of the mathematical description of gas emissions heterogeneous catalytic conversion process taking into account factors such as: content of harmful substances in the gas flow, concentration of the catalytic substances on the carrier surface, specific surface of the catalytic coating, rate and temperature of gas flow, and the impact of catalytic surface reaction on the oxidation reaction occurring in the core of gas flow.

- For the first time the morphology and characteristics of the formation of a catalytic layer on the glass-crystalline coatings of metals and their oxides will be shown. For the first time the connection of qualitative, quantitative composition and morphology of glass-crystalline coating and the catalytic activity of the catalytic coating will be shown .

- **Practical significance**

- Development of a new type of catalytic coatings on the glass-crystalline films will allow to design and manufacture on its basis a block for catalytic purification of gas emissions of thermal power plants, waste processing complexes and automobile transport.