

**BULGARIAN ACADEMY OF SCIENCES  
INSTITUTE OF CATALYSIS**

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**PLAN**

**FOR THE SCIENTIFIC RESEARCH ACTIVITIES**

**YEAR 2013**

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<b>№</b>	<b>Theme of the project</b>	<b>Project leader, number of participants</b>	<b>Financial resources (№ of the contract, program etc.)</b>
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<b>I. Projects, sponsored only by the budget subsidy of BAS</b>			
<b>LABORATORY "NEW CATALYTIC MATERIALS AND NANO-SIZED CATALYSTS"</b>			
I.1	Tungsten, molybdenum and rhenium-containing catalysts for the production of hydrogen from sulfur-containing gases: synthesis, modifying and catalytic properties	Assist. Prof. D. Nikolova, PhD 3 participants	
I.2	Nano-sized gold catalysts, supported on modified cerium dioxide, for oxidation reactions	Assoc. Prof. L. Ilieva, PhD 5 participants	
I.3	New supported nano-sized catalysts for environmental protection reactions	Prof. T. Tabakova, PhD 5 participants	University of Torino, Italy
I.4	Preparation, physical-chemical and catalytic properties of new adsorbents and supported catalysts	Assoc. Prof. D. Paneva, PhD 10 participants	

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<b>LABORATORY "CATALYTIC PROCESSES RELATED TO ENERGY AND ENVIRONMENTAL PROTECTION"</b>			
I.5	Production of alternative fuels from renewable carbon-containing raw materials	Prof. S. Damyanova, DSc 6 participants	Bilateral research cooperation between IC-BAS and the Institute of Catalysis and Petroleum Chemistry, Madrid, Spain
I.6	Preparation and investigation of catalysts for selective oxidation and dehydrogenation of light alkanes	Assoc. Prof. D. Filkova, PhD 4 participants	
I.7	Structure and properties of mixed oxide catalytic systems	Assoc. Prof. N. Kostova, PhD 8 participants	
I.8	Theoretical study of the role of diffusion to induce size effects in nano-catalytic systems and other noise-induced phenomena	Assoc. Prof. M. Koleva, PhD 2 participants	
I.9	Preparation and characterization of catalysts for hydro-treatment	Assoc. Prof. Ch. Vladov, PhD 2 participants	
I.10	Hydrogen production from renewable resources	Prof. S. Damyanova, DSc	Bilateral research cooperation between IC-BAS and Universidade Federal de São Carlos, Estado São Paulo, Brazil
<b>LABORATORY "MOLECULAR CATALYSIS WITH CENTER FOR ESR SPECTROSCOPY"</b>			
I.11	Kinetics and mechanism of reactions of ozone with organic and polymeric compounds. Ozone destruction and stabilization	Assoc. Prof. M. Anachkov, PhD 5 участници	
I.12	Diffusion and kinetic region of operation of catalytic and photocatalytic reactors	Assoc. Prof. A. Eliyas, PhD 4 participants	
I.13	Photocatalysis and Advanced Oxidation Processes (AOP)	Prof. V. Iliev, PhD 10 participants	
I.14	Synthesis and properties of spiro-cyclic photo-chromic compounds	Assist. Prof. S. Minkovska, PhD 4 participants	

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I.15	Plasma-chemical preparation of nano-disperse products for the purposes of catalysis	Prof. S. Rakovsky, DSc 14 participants	
I.16	Applied ESR spectroscopy	Assist. Prof. Y. Karakirova, PhD 3 participants	
I.17	Theoretical investigation of oxide materials	Assoc. Prof. V. Alexiev PhD 3 participants	
I.18	ESR application in catalysis	Assoc. Prof. V. Alexiev, PhD 4 participants	
I.19	Utilization of the plant Clinopodium Vulgare L. in the struggle against neo-plastic diseases	Assist. Prof. S. Minkovska, PhD 2 participants	

## II. Projects, funded additionally by contracts with the National Science Fund (NSF)

### LABORATORY "NEW CATALYTIC MATERIALS AND NANO-SIZED CATALYSTS"

II.1	New nano-composite catalysts for decreasing the content of CO in cigarette smoke and in industrial exhaust gases	Prof. I. Mitov, DSc 4 participants	NSF at Ministry of Education DDVU-02/07/2010
II.2	New materials for the electronics and for the ecology on the basis of biogenic iron oxides	Prof. I. Mitov, DSc 5 participants	NSF at Ministry of Education DID-02-38/09
II.3	Innovative approach for the preparation of structured catalysts for neutralization of methane emissions	Prof. P. Stefanov, PhD 7 participants	DNSF-T01/6
II.4	Production, purification and storage of hydrogen and other energy sources on the basis of biomass by using newly developed catalysts and adsorbents	Prof. I. Mitov, DSc 20 participants	DNSF -E01/7/2012
II.5	Conversion of biomass into energy	Assoc. Prof. L. Ilieva, PhD 5 participants	DCOST-01/8 of 13.12.2012

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<b>LABORATORY "CATALYTIC PROCESSES RELATED TO ENERGY AND ENVIRONMENTAL PROTECTION"</b>			
II.6	Production of alternative fuels from renewable carbon-containing raw materials: reforming of biogas into hydrogen	Prof. S. Damyanova, DSc 6 participants	NSF DTK-02-36/09
II.7	Mechano-chemical synthesis, activation and characterization of inorganic chemical systems: mixed oxides, sulfides, selenides and carbonates	Assoc. Prof. N. Kostova, PhD 6 participants	NSF at ME DNTS/Slovakia 01/3
<b>LABORATORY "MOLECULAR CATALYSIS WITH CENTER FOR ESR SPECTROSCOPY"</b>			
II.8	Innovative approach for the preparation of structured catalysts for the neutralization of methane emissions	Prof. P. Stefanov, PhD 7 participants	NSF-T01/6
II.9	Elaboration of a method, pilot plant installation and investigations on plasma-chemically synthesized nano-dispersed materials and their applications	Prof. S. Rakovsky, DSc 8 participants	NSF № TK 199/17.12. 2008
II.10	High-frequency pilot plant installation for preparing and studying plasma-chemically synthesized new nano-dispersed materials and their applications	Acad. Al. Popov Prof. S. Rakovsky, DSc 8 participants	NSF № TK 66/17.12/2009
<b>III. Projects, additionally sponsored by contracts with ministries and EU, NATO, UNESCO programs and other international organizations</b>			
<b>LABORATORY "NEW CATALYTIC MATERIALS AND NANO-SIZED CATALYSTS"</b>			
III.1	Catalytic processes for environmental protection in the presence of Au and Au-Pd catalysts, supported on modified cerium and iron oxides: deNOx and PROX reactions	Assoc. Prof. L. Ilieva, PhD 5 participants	NATO CLG 984 160/2011
III.2	Conversion of biomass into energy	Assoc. Prof. L. Ilieva, PhD 3 participants	COST CM 0903/WG02

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<b>IV. Projects for Equivalent Non-currency Visit Exchange (ENVE) within the framework of inter-academic and inter-institute collaboration</b>			
<b>LABORATORY "NEW CATALYTIC MATERIALS AND NANO-SIZED CATALYSTS"</b>			
IV.1	Gold catalysts, deposited with FeO <sub>x</sub> CoO <sub>x</sub> cerium dioxide, for catalytic processes, designed for environmental protection: water-gas shift reaction, preferential oxidation of CO (PROX) and complete oxidation of hydrocarbons	Assoc. Prof. L. Ilieva, PhD 5 participants	IPC PAS, Warsaw, Poland
IV.2	Reduction behavior of nano-structured gold catalysts, deposited on cerium dioxide, modified with metal oxides of different reducibility: TPR and kinetic parameters of the reduction reaction	Assoc. Prof. L. Ilieva, PhD 5 participants	IPC RAS, Bucharest, Romania
IV.3	Synthesis and catalytic properties of heterogeneous catalysts	Prof. I. Mitov, DSc 6 Participants	ICTM BU, Belgrade, Serbia
IV.4	Ni/SiO <sub>2</sub> catalysts for hydrogenation of vegetable oils for nutrition purposes having controlled porous structure	Assoc. Prof. M. Gabrovska, PhD 4 participants	ICTM BU, Belgrade, Serbia
IV.5	Catalytic application of nano-sized oxide materials	Assoc. Prof. M. Gabrovska, PhD 5 participants	IPC RAS, Bucharest, Romania
IV.6	Catalysts on the basis of noble metals, deposited on complex nano-sized oxides of cerium, titanium and zirconium for the oxidation of volatile organic compounds and oxidation of CO in hydrogen-rich gaseous mixtures	Assoc. Prof. S. Todorova, PhD 6 participants	IPC RAS, Bucharest, Romania

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<b>LABORATORY "CATALYTIC PROCESSES RELATED TO ENERGY AND ENVIRONMENTAL PROTECTION"</b>			
IV.7	New heterogeneous catalysts for environmental protection	Assoc. Prof. G. Tyuliev, PhD 3 participants	IPC CAS, Prague, Czech Republic
IV.8	Mechanochemical synthesis of nano-materials, characterization, photocatalytic and anti-cancer properties	Assoc. Prof. N. Kostova, PhD 8 participants	Institute of Geo-techniques, SAS, Kosice, Slovakia
IV.9	Reforming of biogas into synthesis gas, enriched in hydrogen	Prof. S. Damyanova, DSc	KUL, Wallonia, Belgium
<b>LABORATORY "MOLECULAR CATALYSIS WITH CENTER FOR ESR SPECTROSCOPY"</b>			
IV.10	Synthesis and study of new photo-controlled complexing agents for metal cations and bio-molecules on the basis of photo-chromic compounds	Assist. Prof. S. Minkovska, PhD	Institute for Heterocyclic Compounds, RAS, Moscow, Russia
IV.11	Ozone and photocatalytic oxidation of organic, biological and high-molecular-weight compounds. Fundamental and innovative aspects.	Prof. S. Rakovsky, DSc 16 participants	IBCP RAS, Moscow, Russia
IV.12	Preparation and study of new inorganic materials	Prof. S. Rakovsky, DSc 14 participants	IIC RTU, Riga, Latvia
IV.13	Theoretical investigation of the surface and bulk phase properties of oxides and nano-systems	Assoc. Prof. V. Alexiev, PhD 15 participants	IPC RAS, Bucharest, Romania
<b>V. Projects – contracts, research tasks assigned by external organizations, including government institutions and private companies from the country and abroad</b>			
<b>LABORATORY "NEW CATALYTIC MATERIALS AND NANO-SIZED CATALYSTS"</b>			
V.1	Spectral analysis of ceramic materials	Prof. I. Mitov, DSc 5 participants	„Techkeramik-M” Co., Mezdra, Bulgaria

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<b>LABORATORY "MOLECULAR CATALYSIS WITH CENTER FOR ESR SPECTROSCOPY"</b>			
V.2	Anodes for alkaline electrolyte cells based on non-noble metals	Prof. S. Rakovsky, DSc 4 participants	GenCell Ltd, Israel
<b>VI. Projects, sponsored by operating programs at structural funds</b>			
VI.1	Formation of highly qualified specialists on contemporary materials for environmental protection: from design to innovations Project BG051PO001-3.3.06-0050	<b>Beneficiary: Institute of General and Inorganic Chemistry - BAS</b> <b>Project Leader:</b> Corr. mem. K. Hadjiivanov, DSc <b>Partner Institutions:</b> <b>1. Institute of Catalysis - BAS</b> <b>Co-Leader:</b> Prof. S. Rakovsky, DSc <b>2. Faculty of Chemistry and Pharmacy Sofia University "St. Kliment Ohridsky"</b> <b>Co-Leader:</b> Corr. mem. T. Spassov, DSc	EUROPEAN SOCIAL FUND 2007 – 2013 OPERATING PROGRAM „DEVELOPMENT OF HUMAN RESOURCES”