QUESTIONNAIRE

(*) – mandatory fields

	Details about organisation
* **Organisation name**	Department of Inorganic chemistry, Yerevan State University, Armenia
Organisation acronym	
* **Organisation Activity** Type (**RES** - Research, **HE** - University, **SME** - Small and Medium Enterprise, **IND** - Industry, **OTH** - Other)	RES, HE
* **Keywords of main research areas**	Combustion synthesis, material science, fine ceramics, cermets, composites, bio-inorganic materials, chemical transportation reactions, solutions' properties.
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* **Description of organisation and its research achievements for the last five years (~ 5000 signs)**
Main scientific achievements in the field of combustion synthesis - the kinetics for a number of solid-phase reactions occurring in the strongly non-isothermal conditions was studied applying electrothermography method. It was shown that isothermal kinetic data not always are suitable for describing non-isothermal processes (e.g., combustion); - new mathematical models on reaction diffusion were developed with the possibility of visualization. For the first time solid-phase diffusion coefficients of carbon and silicon in a series of carbides and silicides were determined within wide temperature intervals; - a new approach was developed in the field of chemical stimulation of combustion processes with participation of solid active additives (combustion promoters). On the basis of this approach new technologies for a series of ceramic materials were developed. A criterion for searching new combustion promoters was formulated and several such compounds (some inorganic salts, teflon, melamine, polyvinylchloride, etc.) were offered, which were effectively applied in a number of systems.

Innovation Activity

- the department has more than 30 accomplished developments for producing ceramic powders (e.g SiC, B_4C, $MoSi_2$, TiSi, TiN, AlN, Si_3N_4, BN, TiB_2-ZrO_2, SiC-$MoSi_2$, Si_3N_4-SiC, Si_3N_4- TiN, Si_3N_4-$MoSi_2$, Si_3N_4-WSi_2, BN-B_4C, BN-AlN), pure metals' and alloys' powders and ingots (Co, Ni, Cu), high-porous (foam-like) metals (Cu, Ni) and ceramics (Ti-Al, Ti-Si, etc.) under the combustion mode.
  -direct obtaining the molybdenum and copper from various raw materials (concentrates, industrial wastes) using the combustion technique is still in development stage.
- an electrothermography setup with wide functional possibilities on electronic controlling and appropriate software was constructed (destined for studying the kinetics of solid-phase rapid chemical transformations under isothermal and non-isothermal conditions.

Current scientific activity of the department is related to the synthesis of refractory inorganic compounds, ceramic and composite materials by the novel combustion synthesis or self-propagating high-temperature synthesis (SHS) method with chemical stimulation; investigations of the kinetics of rapid solid-phase reactions between metals and non-metals at high temperatures including strongly non-isothermal conditions; theory of reactive diffusion, as well as thermal-diffusion theory of metal particle ignition and their experimental confirmation for a number of systems.

Main scientific achievements in the field of chemical transportation reaction

Low temperature heterogeneous reactions of H_2O_2 vapours with various solid metal-oxides, halogenides and chalcogenides have been discovered. They are new types of chemical transportation reactions and have definite advantages over the existing ones. It has been shown, that by these reactions it is possible to obtain mono and multicrystalline films having valuable optical and electrical properties; to modify the same surface (both non-porous and porous materials) by nanoparticles of any size (beginning from simple molecular dimensions) of unlimited number of compounds with their required ratio, both in needed sequence and in parallel. Such metal-oxide (ZnO, CdO, MgO, CuO, MoO_3, NiO, WO_3 and other) nanopartical catalysts have been prepared and used in hydroreforming, cracking and oxidation processes of hydrocarbons. They demonstrate great activity and efficiency.
Based on the investigation of kinetics and mechanisms of a new transport reaction, a technology for obtaining oxide and chalcogenide monocrystalline film materials with high optical, opto-electrical properties was developed. Based on the study of kinetics and nature of chemical transport, a process mechanism is proposed. Monocrystalline films were obtained at rather low substrate temperatures by chemical transport of ZnO, ZnS using H_2O_2. This method is characterized by high selectivity, does not pollute the films and meets environmental requirements. The method for growing of film materials was modified to obtain various multi-component oxide and chalcogenide systems. Using the transport reaction, a method for supplying the film materials with needed dopands (in any ratio and sequence) to substrates was developed.

	Contact Information
* **Contact person (first name,**	Hayk L. Khachatryan

family name)	
* **Department / Laboratory**	Department of Inorganic chemistry, YSU
* **Position**	Associated professor
* **Qualification and research experience**	PhD, 9 years R&D experience in the field combustion synthesis, material science, fine ceramics, ceramic foams.
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International co-operation / Participation in EU RTD programmes or other bilateral / multilateral actions INTAS, TACIS, TEMPUS, COST, EUREKA, other RTD programmes (please specify programme/s, project title/s and year/s
Fulbright scholar program (USA) (www.cies.org) (US collaborator prof. J. Puszynski, South Dakota school of Mines and Technology (SDSM&T) // Combustion synthesis and densification of superhard titanium diboride ceramic powders reinforced by fully and/or partially stabilized zirconia 2007-2008 ANSEF Award #EN-646 // New zirconium-based biomaterials, 2007 SNSF (www.cnf.ch) Grant PIOI2-117177 // Swiss collaborator: J.Kuebler, Empa, Duebendorf // New Si3N4-MoSi2/MoSi2 composite materials for high-temperature applications Kh.V. Manukyan, 2007 National Award No.0557 // The laws of structure formation of metallic, intermetallic and ceramic high-porosity (foam) materials and their characterization, 2005-2007 ANSEF Grant # NS8, 2003 Project Title: The modification of natural zeolites, existing in the territory of Armenia, through chemical transportation reaction and their use in CO's hydration reaction. ISTC grant A-629, 01.08.2003 – 31.07.2006 Project Title: "Obtaining of monocrystalline oxide and chalcogenid films by chemical transportation of crystalline compounds".

	* Please, use "X" to indicate the scientific area/s of your potential project
CHEMISTRY	X
SOCIAL AND HUMAN SCIENCES	
ECONOMIC SCIENCES	
ENGINEERING SCIENCE	X
ENVIRONMENT	
AGRICULTURE AND FOOD	
HEALTH	
MATHEMATICS	
INFORMATION SCIENCE	
PHYSICS	
NANOTECHNOLOGIES	
ENERGY	
TRANSPORT	
SPACE	

* Summary of potential research project envisaged hosting of European researcher for the period of between 1 and 2 years
We can cooperate in the field of combustion synthesis of inorganic refractory materials such as fine ceramics (carbides, borides, nitrides, silicides etc.), ceramic composites (Si3N4-SiC, WSi_2-SiC, $MoSi_2$-SiC, etc), and cermets (e.g. SiC-Cu, SiC-Al, TiN-Mo, Si_3N_4-Co, etc.), ceramic foams (e.g. TiSi, TiAl, etc.), metallic powders (i.e. Cu, Ni, Co, Pb), bio-inorganic ceramic and metallic composites. We can make also thin film by chemical transportation reaction.

	Please, confirm your agreement on data publication and dissemination
I agree with the publication of the data on the web-site **http://www.inco-eeca.net**, and **dissemination** among Mobility National Contact Points of the EU MS and AC **(YES / NO)**	Yes
Date	21.11.2008