

Summary report on research accreditation

I. General information

Name of organization	Institute of Chemistry of the Academy of Sciences of Moldova
Organization type (<i>to underline</i>)	<u>Research institute</u> High education institution Ministerial research institute
Research mission of organization	Synthesis, structure and properties of new polyfunctional substances, chemical processes and technologies useful for the economy and environment
Strategic research direction (s)	<ol style="list-style-type: none"> 1. Capitalization of human, natural and information resources for a sustainable development of economy; 2. Nanotechnologies, industrial engineering, new products and materials
Evaluated period	2005-2009
Web of organization	www.chem.asm.md

II. Research capacity (annual average for evaluated period)

Total number of employees	140,2					
Number of scientific researches	98,4					
Number of researches who possess honorific titles, scientific degrees, scientific and scientific-didactical titles	ASM full members	ASM corresp. Members	Professor	Associated professor	Dr.hab.	Dr. (PhD)
	2,6	1,4	9,4	15,2	14,4	38,6
Number of researches involved in international projects	FP7	STCU	Bilateral	Others		
	0	0	35	55		
Number of young researches (under 35 years old)	Dr. (PhD)	PhD students	Others			
	6,2	16,6	7,0			
Financial resources (thousand MDL)	Public budget	International projects/grants	Research contracts			
	10588,4	194,3	149,4			
Distribution of expenditures (thousand MDL)	Salary	Infrastructure development	Other			
	4678,9	4096,5	2883,4			
Expenditures for infrastructure development (thousand MDL)	Equipments	IT infrastructure	Endowment of experimental resorts			
	2993,8	154,5	0			
List of 3 basic research methods, installations, technologies (per accredited field)	<ol style="list-style-type: none"> 1. Nuclear Magnetic Resonance; 2. IR and UV-Vis spectroscopies; 3. Mossbauer spectrometry. 					
List of provided scientific services	<ol style="list-style-type: none"> 1. Determination of toxic metals in food; 2. Determination of metals in water (ground, surface, mineral, potable); 3. Analysis of metals and alloys; 					

	<ol style="list-style-type: none"> 4. Determination of metals in the divine, fruit and vegetable juice, wines and wine materials; 5. Elemental analysis by atomic absorption method in vegetal and animal samples; 6. Elemental analysis by atomic absorption method in soils, rocks and sediments, glass; 7. Measurements of structural parameters; 8. Recording of infrared spectra; 9. Recording of spectra in ultraviolet and visible regions; 10. Recording of Nuclear Magnetic Resonance spectra; 11. Elemental analysis: Carbon, Hydrogen, Nitrogen; 12. Mass chromatogram Detector.
List of editorial activities	<p>In 2006, the Institute of Chemistry launched the publication of the annual journal „Chemistry Journal of Moldova”.</p> <p>Editorial activities in the frame of organization of: the XXIIth edition of the International Conference in coordination chemistry “L. Chiugaev” (2005); the IInd edition of the International Moldavian-Polish-Ukrainian Symposium on Supramolecular Chemistry (2005); the XVth and XVIth editions of the International Conference „Physical Methods in Coordination and Supramolecular Chemistry” (2006 and 2009); the IInd International Conference of the Chemical Society of the Republic of Moldova (2007); the International Conference “Ecological and economical problems of the Dniester River” (2008); the International Conference dedicated to the 50th anniversary from the foundation of the Institute of Chemistry of the A.S.M.</p> <p>The following monographs were published in 2009:</p> <ol style="list-style-type: none"> 1. Academician Pavel Vlad - illustrious scientist and tenacious promoter of science. Chisinau: Typography of ASM, 2009. 345 pages. 2. Tudor Lupaşcu, Gheorghe Duca, Galina Lupaşcu. Enoxil – ecological preparation for plant protection. Chisinau: Typography of ASM, 2009. 144 pages.



III. Distribution of number of research projects and themes during evaluated period

Institutional projects	2005	2006	2007	2008	2009
	13	4	4	4	6
Projects in the frame of State Programs	2005	2006	2007	2008	2009
	1	3	3	3	7
Technological transfer projects	2005	2006	2007	2008	2009
	0	1	1	1	0
Projects for equipment procurement	2005	2006	2007	2008	2009
	0	0	0	1	0

Projects for young researches	2005	2006	2007	2008	2009
				4	4
Projects in the frame of bilateral programmes	2005	2006	2007	2008	2009
	0	0	6	2	6
International projects/grants	2005	2006	2007	2008	2009
	1	6	8	4	2
List of 3 representative international projects/grants	<ol style="list-style-type: none"> SNF-SCOPES IB7320-110823 „Design, synthesis and study of coordination compounds of 3d- and 4f-metals using functionalized macro- and heterocyclic ligands for possible medicinal and therapeutic applications”. <i>Project manager: Turta Constantin, academician, dr. hab. in chemistry in collaboration with Professor Helen Stoekli-Evans, Institute of Chemistry of the University of Neuchatel (Switzerland), 2006-2008.</i> CRDF/MRDA „Synthesis and investigation of homo-, hetero- and mixed valence iron complexes with carboxylate and hydrazine derivatives ligands as new catalysts for oxygenation of hydrocarbons”. <i>Project manager: Revenco Mihail, corr. memb., dr. hab. in chemistry in collaboration with Professor Perikles Stavropulus, University of Missouri, SUA, 2006-2007.</i> CRDF/MRDA STEP-625 “Implementation and Optimization of the Activated Coal Mass-production Using Non-traditional Raw Material”. <i>Project manager: corr. memb., dr. hab. in chemistry Tudor Lupaşcu, 2007.</i> 				
Research contracts	2005	2006	2007	2008	2009
	3	0	1	42	161
List of 3 representative research contracts	<p>Scientific works have been carried out in the frame of economic contracts with the following economic agents:</p> <ol style="list-style-type: none"> „Doina Vin” SRL, Company „Codru-Noroc” and National Institute of Winegrowing and Winemaking – production of preparation Virinil (Laboratory of Bioinorganic Chemistry and Nanocomposites); „Termocom” SA - production of substances for staining of water from the heating system (Laboratory of Terpenoid Chemistry); ICCC „Selectia”, mun. Bălţi – production of preparation „ENOXIL-A” (Laboratory of Ecological Chemistry). Institute of Applied Physics of ASM, synthesis of metal-organic polymers based on homonuclear clusters bridged by N and O containing donor atoms to porous structures (Laboratory of Coordination Chemistry). 				

IV. Scientific publications

Total number of publications abroad	Books 1	Chapters in books 1	Journal papers 159
Total number of publications in ISI journals and books	Books 1	Chapters in books 1	Journal papers 133

Total number of publications in the country	Books 6	Chapters in books 1	Journal papers 90
Total number of conference abstracts	International abroad 512	International in the country 26	National 9
List of 5 representative publications (per accredited field)	<ol style="list-style-type: none"> 1. Prodius D., Macaev F., Mereacre V., Shova S., Lutsenco Y., Styngach E., Ruiz P., Muraviev D., Lipkowski Ja., Simonov Yu. A. and Turta C. Synthesis and characterization of {Fe₂CuO} clusters as precursors for nanosized catalytic system for Biginelli reaction. <i>Inorganic Chemistry Communications</i>, 2009, 12, p. 642-645. 2. Gavrilov K.N., Benetsky E.B., Grishina T.B., Zheglov S.V., Rastorguev E.A., Petrovskii P.V., Macaev F.Z., Davankov V.A. Diastereomeric <i>P</i>*-chiral diamidophosphites with terpene fragments in asymmetric catalysis. <i>Tetrahedron: Asymmetry</i>. 2007, 18, 2557-2564. 3. Dragancea, D., Arion, VB., Shova, S., Rentschler, E. and Gerbeleu, NV. (2005): Azine-bridged octanuclear copper(II) complexes assembled with a one-stranded ditopic thiocarbohydrazone ligand. In: <i>Angewandte Chemie, Int. Ed.</i>, 44, 2008, 7938-7942. 4. Vlad P. F., Ciocarlan A.G., Coltsa M.N., Deleanu C., Costan O., Simonov Y.A., Kravtsov V.Ch., Lipkowski Janusz, Lis Tadeusz, Aede de Groot. Photodegradation of some 14, 15-bisnorlabdene-13-ones, derived from larixol. Synthesis of drimanic dienes with functional groups at C-6. <i>Tetrahedron</i>, 2006, Vol. 62, N 36, p. 8489-8497. 5. Tudor Lupașcu, Muhail Ciobanu. Adsorption of Humic Acids and some Metal Ions from aqueous Solutions on Activated Carbons. <i>Environmental Engineering and Management Journal</i>. September/October 2009, Vol. 8, No.5, 1039-1043. 		

List of 5 citations	<ol style="list-style-type: none"> 1. Marina Grinco, Veaceslav Kulcički, Nicon Ungur, Wieslaw Jankowski, Tadeusz Chojnacki, Pavel F. Vlad. Superacid-Catalyzed Cyclization of Methyl (6Z)-Geranylfarnesoates. <i>Helvetica Chimica Acta</i>, 2007, Vol. 90(6), 1223-1229 (6 citations). 2. Valeriu Mereacre, Denis Prodius, Ayuk M. Ako, Narpinder Kaur, Janusz Lipkowski, Charles Simmons, Naresh Dalal, Ion Geru, Christopher E. Anson, Annie K. Powell, Constantin Turta. Synthesis, structure and magnetic properties of unsymmetrical dodecanuclear Mn–Ln clusters. <i>Polyhedron</i>, 2008, V.27, I.11, 2459-2463 (15 citations). 3. Valeriu Mereacre, Motohiro Nakano, Jordi Gómez-Segura, Inhar Imaz, Christian Sporer, Klaus Wurst, Jaume Veciana, Constantin Turta, Daniel Ruiz-Molina, and Peter Jaitner. A New Hexaferrocene Complex with a $[M_3(\mu_3-O)]^{7+}$ Core. <i>Inorganic Chemistry</i>, 2006, 45(26), 10443-10445 (10 citations). 4. M. Mercedes Maroto-Valer, Ion Dranca, David Clifford, Tudor Lupascu, Raisa Nastas, Carlos A. Leon y Leon, Thermal regeneration of activated carbons saturated with <i>ortho</i>- and <i>meta</i>-chlorophenols. <i>Termochimica Acta</i>, 2006, V. 444, I. 2, p. 148-156 (11 citations). 5. Svetlana G. Baca, Iurii L. Malaestean, Tony D. Keene, Harry Adams, Michael D. Ward, Jürg Hauser, Antonia Neels and Silvio Decurtins. One-Dimensional Manganese Coordination Polymers Composed of Polynuclear Cluster Blocks and Polypyridyl Linkers: Structures and Properties. <i>Inorganic Chemistry</i>, 2008, 47(23), 11108-11119 (17 citations).
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V. Innovation outputs

Total number of patents	Registered in the country 41	Registered abroad 0	Implemented 23
Total number of new developed methods and technologies	Registered 0	Non-registered 98	Implemented
Total number of new scientific products	Registered 0	Non-registered 505	Implemented 9
Total number of scientific outputs for central and local authorities (draft of law, strategies etc.)	15		
Total number of scientific outputs for educational institutions	Handbooks for high education 4	Handbooks for pre-university institutions 0	Delivered university courses 15

List of 5 representative innovation outputs (per accredited field)	<ol style="list-style-type: none"> 1. A new approach of enotannins oxidation, which allows obtaining of biological active substances „ENOXIL-M” and „ENOXIL-A”. <i>Performer:</i> Laboratory of Ecological Chemistry. <i>Manager:</i> corr. memb. Lupaşcu Tudor. 2. Novel construction materials. <i>Manager:</i> dr. hab.Lupaşcu Tudor. 3. Flavouring compositions for new type tobacco aromatization. <i>Performer:</i> Laboratory of Terpenoid Chemistry. <i>Manager:</i> acad. Vlad Pavel. 4. 12-Hydroperoxy-8α, 12-epoxy-11-bishomodriman with antimycotic activity. <i>Performer:</i> Laboratory of Terpenoid Chemistry. <i>Manager:</i> acad. Vlad Pavel. 5. Stimulator of callus growth „Virinil”. <i>Performer:</i> Laboratory of Bioinorganic Chemistry and Nanocomposites. <i>Manager:</i> Acad. Turta Constantin.
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VI. Major scientific and innovation achievements

Short description of main scientific results and its confirmation (by awards, citations, development of international projects etc.)	<ol style="list-style-type: none"> 1. Procedures of obtaining and regenerating of activated carbons from vegetal waste were elaborated; medicinal preparations on the basis of activated carbons, catalysts and adsorbents for the purification of ground and surface waters were created. There was established that intact activated carbon CAN-8, obtained by physical-chemical method from nut shells in experimental conditions, possess catalytic activity, which is caused both by the presence of basic functional groups on intact activated carbon surface and forming at the interface of OH[•] radicals with a high oxidation potential. Catalytic performance of intact activated carbon CAN-8 in the oxidation of methylene blue was shown in 25 cycles. There has been established that after the last cycle the content of basic groups on activated carbons surface has decreased significantly but without significant decrease of its catalytic activity. 2. Effective methods have been developed for the synthesis of „butterfly” type of iron heterotetranuclear carboxylate clusters with {Fe₃MO₂} core, where M = 4f metals (rare earth), including three compound with M = Tb, Dy, Ho which possess molecular magnets properties at temperatures under 2 K and values of activating energy of \approx 8, 9 and 10 K, respectively. Effective methods have been proposed for obtaining of homo- and heteropolynuclear carboxylate clusters of rare-earth metals. Complexes with {4f-4f'} and {4f-Ba(Sr)} entities, possessing magnetic and luminescent properties have been synthesized. A method for obtaining of iron (III) or mixed valence oxides nanoparticles, using iron homo- and heterotrinuclear carboxylate clusters as precursors and sunflower oil as surfactant substance was proposed. 3. For the first time was accomplished the biomimetic synthesis of sacculatanic diterpenoids with a specific structure consisting of linear compounds with two terminal functional groups. At the key stage the superacidic cyclization reaction, developed in the Laboratory of Terpenoid Chemistry, was used. This procedure reproduces the mechanism and the natural way of formation of these hardly accessible substances and opens the access to cyclic terpenoids with a specific functionalization. 4. Efficient methods of synthesis of organic macrocyclic and heterocyclic compounds from thiazole group, and heteronuclear coordination
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	compounds of 3d and 4f elements were developed. These methods allowed obtaining of more than 100 new substances with useful properties: promising compounds for biotechnology and against tuberculosis or cancer, as well for obtaining magnetic oxide nanoparticles. Tests made on synthesized substances have shown the presence of promising compounds for biotechnology and against tuberculosis or cancer.				
Number of organization' invited speakers at international conferences	2005 4	2006 7	2007 4	2008 5	2009 4
Short description of technological transfer and innovation results and its certification by implementation	<p>1. Studies were performed on construction objects of corporation "Monolit" (Calea Orheiului str., 103). Researches, which were carried out within a separate project, have resulted in the creation of a similar composition of gypsum-based dry mixtures for different surfaces: concrete, bricks and stone surfaces.</p> <p>From November, 5 to November, 6 2007 at the construction site of corporation "Monolit" on Calea Orheiului str, 103, plastering works have been performed with mixtures of different compositions for plastering with different setting time on concrete, burnt bricks and stone surfaces. As result, the optimal composition was found for all surfaces on the basis of receipts issued by the Institute of Chemistry of the ASM (Verification paper Nr. 13 from November, 5-7, 2007). Plaster mixtures developed at the Institute of Chemistry of the ASM are recommended for widespread implementation at "Monolit" corporation.</p> <p>2. A method for obtaining of ultramicrodisperse suspension was developed. The method consist of sedimentation of $\text{CuSO}_4 \cdot 3\text{Cu}(\text{OH})_2 \cdot 0.5\text{H}_2\text{O}$ salt from a dilute CuSO_4 (0,5~1,5%) solution in the presence of $\text{Al}_2(\text{SO}_4)_3 \cdot 18\text{H}_2\text{O}$ (0,1~0,3%) and NH_4OH (5~15%) at vigorous shaking. In parallel to copper salt formation, in the reaction zone forming of $\text{Al}(\text{OH})_3$ takes place, which runs colloid-protective function by blocking the formation of $\text{CuSO}_4 \cdot 3\text{Cu}(\text{OH})_2 \cdot 0.5\text{H}_2\text{O}$ crystals at stage of nucleation of submicron size. The obtained product was toxicologically and biologically tested in the field and registered in the State Register of RM plant sources. The technological line for industrial production of this preparation was installed at the experimental enterprise of ASM.</p>				
Number of defended dr.hab. and dr. theses per year	2005 1 and 0	2006 1 and 3	2007 0 and 5	2008 0 and 3	2009 0 and 1

VII. Present/further involvement in the Seventh Framework Programme (FP7): specific programmes (Cooperation, Ideas, People, Capacities) of interest and its sub-divisions.

Currently, at the Institute of Chemistry scientific works are performed within two FP7 projects:

1. CHIRALIX: "**Heterometallic and mixed valence "Chirale magnetic bricks" in assembler of Single Molecule and Single Chain Magnets for nano-dimension magnetic materials.**" People: Life-long training and career development. Grant agreement PF7 nr. 235018 within Marie Curie

Actions: individual research grant for scientists going to Europe (International Incoming Fellowship), including also a reintegration grant for returning to R. Moldova: FP7 CHIRALIX nr. 235018. Project manager: dr. in chemistry Ghenadie Novitchi. Project duration: 01.02.2010 - 31.01.2013.

2. FP7 IRSES nr. 246902 „**Photocatalytic Cluster Complexes for Artificial Photosynthesis Applications**”. Project manager: acad., dr. hab. in chemistry, prof. Constantin Turta. Project duration: 2010-2011 (13 months).

VIII. Accredited research field and its evaluation by the National Council for Accreditation and Attestation of the Republic of Moldova (very good/good/ satisfactory)
Synthesis, structure and properties of new polyfunctional substances, chemical processes and technologies useful for the economy and environment (good).

IX. Category (A/B/C) attributed by the National Council for Accreditation and Attestation of the Republic of Moldova to the organization:

Category A

X. Institutional development actions planned for the next 5 years (maximum ½ page).

1. Creation within the Institute of a centre for medical and biological properties tests on synthesized compounds in institutional laboratories for increasing the effectiveness of research and level of exploitation of the results.
2. Streamlining of the Centre of “Physical Chemistry and Nanocomposites” in order to improve its efficiency as research unit.
3. Information network development and improving of spectral analysis database through programs and software acquisition.
4. Expanding of collaborations with research institutions within the country and abroad with the aim of methodology developing and validation of performed analytical methods.
5. Increasing of PhD students’ rate, which defend doctoral theses, in all laboratories of the Institute.
6. Undertaking of some actions towards a more active participation to the international competitions and contracting with foreign economic agents in order to receive additional funds and increase the rate of special funds.