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Final report about the OTKA PD-109129 grant (2013-2017)

1. Publications

During the OTKA PD grant, the Principal Investigator (PI) published 41 international journal papers (sum of impact factors: 68.574), from which 20 were closely related to the grant. He was coauthor of 99 conference presentations (14 plenary/invited/keynote lectures, 61 oral and 24 poster presentations), from which 64 were closely related to the grant.

2. Research group

As written in the grant proposal, the career goal of the applicant is to build up an internationally significant research group at BME. During the OTKA-PD grant, he managed to establish his group, and extend it considerably. The group usually consists of 15-20 foreign and Hungarian postdocs, PhD, MSc, and BSc students. At present the members include László Bakos, Nóra Justh, Orsolya Kéri, Teodóra Kovács, Andrea Nagy Dávidné, Vincent Odhiambo (from Kenya) (PhD students, among whom the supervision of Dávidné Nagy is done through a collaboration of University of Edinburgh, Scotland), Gubakhanim Shaznarova (from Azerbajan), Joshua Mensah (from Ghana), Eszter Majzik, Ádám Pataki, Levente Studnicka, Rita Szalai (MSc students, many of them worked also in the group as BSc students); Csilla Agócs, Péter Bárdos, Balázs Halmai, Gréta Kovács, Boglárka Mészáros (BSc students).
Previous members of the research group during the OTKA PD grant: Dr. Stefan Boyadjiev (from Bulgaria) (postdoctor); Tamás Firkala, Dávid Hunyadi, József Magyari (short term guest student from Serbia) (PhD students); Fanni Fekete, Fanni Gáber, Gábor Király, Eszter Kocsis, Hunor Menyhárt,Gergő Mikula, Beáta Nagy, Arshak Szenkovits (MSc students, many of them worked also in the group as BSc students); Alex Leandro Andrade de Lucena, João Pedro Oliveira Lima, David de Araújo Alves, Ulisses Carlo M. S. B. Costa, Gustavo dos Santos Lopes, Diogo Corrêa Santos, Alexandre Kotchenko (all from Brazil) (BSc students).
During the OTKA PD grant, the PI supervised 1 PhD, 9 MSc and 10 BSc defended theses. He was the supervisor of 10 students, who took part at the annual student scientific conference (TDK) of BME, and they obtained two I, three II and three III prizes. Four of his students also took part at the national final of the student scientific conference (OTDK), and they obtained one II and one III prizes.

3. Awards and acknowledgments

The PI received the ÚNKP (New National Excellence Program) Scholarship (2017-2018).
The PI obtained the János Bolyai Research Fellowship of the Hungarian Academy of Sciences (2015-2018) for the second time. His first János Bolyai Research Fellowship of the Hungarian Academy of Sciences (2011-2014) has been evaluated as being excellent.
Due to his outstanding reviewer activity, the PI received the Top10 Reviewer at the Materials Chemistry and Physics journal acknowledgement (2013).

4. Research Grants

During the OTKA PD research grant, the PI submitted numerous research grants proposals, of which many has been successful. In these, he was either the principal investigator or a participant. The great majority of the grants is closely related to the OTKA PD grant, and they are about the preparation of semiconductor oxide based complex nanostructures and their application in photocatalysis, gas sensing as well as in electrochromic, catalytic, energy and thermal fields. The list of the obtained research grants:

- NKFI-123631 (Hungarian-Thai international Cooperation grant), principal investigator (2018-2020, ca. 116000 EUR, from which the part of Dr. Szilágyi is ca. 58000 EUR, Application of oxide and carbon nanostructure based nanofluids in energy and thermal systems)
- ÚNKP-17-4-IV-BME-188, principal investigator (2017-2018, ca. 16000 EUR, Photocatalytic nanocomposites)
- VEKOP-2.3.2.-16-2017-00013, participant (2017-2021, ca. 2539000 EUR, from which the part of Dr. Szilágyi is ca. 90300 EUR, Materials science excellence center: development of environmental friendly processes for the efficient use of renewable energy and raw material sources and for the controlled release of their energy content)
- GINOP-2.2.1-15-2017-00084, participant (2017-2020, ca. 2516000 EUR, from which the part of Dr. Szilágyi is ca. 32000 EUR, Technology development to reduce the harmful contamination of industrial exhaust gases with the research of new, modified surface kaolinite clay mineral ad zeolite composite catalysts)
- K 124212, participant (2017-2021, ca. 152000 EUR, from which the part of Dr. Szilágyi is ca. 42000 EUR, Photocatalytically active hollow-structured semiconductor oxides for environmental applications)
- János Bolyai Fellowship of the Hungarian Academy of Sciences, Principal investigator (2015-2018, ca. 16000 EUR funding from Hungarian Academy of Sciences, Photocatalytic and gas sensing semiconductor oxide nanofilms and nanocomposites)
- TÉT_15-1-2016-0036 (Bilateral Montenegro-Hungary Research and Technology program), principal investigator (2016-2018, ca. 9000 EUR, Nr., Synthesis, physico-chemical and biological characterization of new transition metal complexes with pyrazole derivates and their potential application)
- Hungarian-Romanian Academy Partnership Programme, principal investigator (2016-2019, ca. 4000 EUR, Semiconductor oxide nanostructures for optical and solar applications)
- MTA Postdoctor Programme, principal investigator – Supervisor of Dr. Stefan Boyadjiev (2013-2015, ca. 35000 EUR, Gas sensitive and electrochromic semiconductor metal oxide core/shell nanocomposites)
- Hungarian-Romanian Academy Partnership Programme, principal investigator (2013-2015, ca. 4000 EUR, Transparent conductive oxide nanomaterials obtained by chemical route)

5. Research results

During the grant, all three research goals were successfully achieved: (i) the different nucleation of TiO_2 grown by atomic layer deposition (ALD) on various WO_3 polymorphs was explored; (ii) WO_3 and core/shell WO_3/semiconductor oxide (e.g. TiO_2, ZnO) nanofibers and nanoparticles were prepared, which were outstanding photocatalysts; (iii) WO_3 and WO_3/semiconductor oxide composite thin films, nanoparticles and nanofibers were obtained and used as gas sensors.

Due to the success of the grant, the research goals were broadened, and several further results were achieved, which were also closely related to the grant, e.g. (i) nucleation of ALD oxide thin films on other semiconductor oxides (e.g. TiO_2, ZnO); (ii) photocatalytic properties of various tungsten oxide, tungstate and other semiconductor oxide based nanoparticles, nanofibers and nanosheets (e.g. $FeWO_4$, TiO_2/ZnO, ZnO/TiO_2, WO_3/Au); (iii) gas sensing of further semiconductor oxide nanofibers and ultrathin films.
Furthermore, the PI's group also contributed to other fields, mostly through invitations received from other groups and institutes.
In the detailed list of the achieved research results, only the related journal papers are cited, since these are attached to the final report on the OTKA website. The conference presentations are listed in the detailed publication list at the end of this report.

5.1. Results in close relation to the topic of the grant (Photocatalytic and gas sensing semiconductor oxide nanostructures)

5.1.1. Hexagonal (h-) WO_3 nanofibers were obtained in a microwave assisted hydrothermal synthesis, while h-WO_3 and monoclinic (m-) WO_3 nanofibers, nanorods and nanoparticles were produced by hydrothermal synthesis. As reference materials hexagonal (h-) and monoclinic (m-) WO_3 nanoparticles were obtained by annealing $(NH_4)_xWO_3$ at 470 and 600 °C, respectively. It was thoroughly investigated how their crystal structure, morphology and composition influenced photocatalysis (Papers 22, 26, 29, 31).
5.1.2. Crystalline and amorphous TiO_2 were deposited onto WO_3 nanoparticles and nanofibers (prepared in 5.1.1.) by ALD. Since the surface OH density of h-WO_3 nanofibers was lower compared to m-WO_3 nanoparticles and nanofibers, during the ALD growth TiO_2 formed particles on h-WO_3 nanofibers and not a uniform film. When the h-WO_3/TiO_2 composite nanowire was annealed, the 1D h-WO_3 structure and morphology was not maintained, since there was no uniform TiO_2 shell around it, but transformed into m-WO_3 nanoparticles (Paper 28).
5.1.3. The 1D h-WO_3/TiO_2 nanocomposite showed more than four times improvement in photocatalytic activity relative to the h-WO_3 nanoparticles and almost two times better performance relative to the h-WO_3 nanofibers and m-WO_3 nanoparticles (Papers 22, 26, 28, 29, 31, a further paper in the pipeline).
5.1.3. Gold nanoparticles were deposited on h-WO_3 nanofibers and their photocatalytic properties were investigated.
5.1.4. Gold nanoparticle decorated m- and h-WO_3 nanoparticles were also obtained and used as catalysts in CO oxidation (Papers 4, 39).
5.1.5. $FeWO_4$ 2D nanosheets were prepared hydrothermally and studied as photocatalysts (Paper 3).
5.1.6. Besides WO_3 nanostructures, the PI and his collaborators synthesized SiO_2 and polymer (PMMA) nanoparticles, OH functionalized fullerene, graphene oxide, carbon nanospheres, polymer and carbon aerogels. On these substrates, he studied the nucleation of amorphous and crystalline TiO_2, ZnO and Al_2O_3 films grown by ALD. It was revealed that ALD deposited few nm thick amorphous TiO_2 had observable photocatalytic property (Papers 1, 2, 16).
5.1.7. ZnO ALD films deposited on WO_3 nanoparticles improved the photocatalytic activity, while decreased the gas sensitivity. As planned, Al_2O_3 films grown by ALD onto WO_3 nanoparticles successfully blocked the surface of WO_3 and erased the gas sensing and photocatalytic properties. The gas sensing of WO_3 films grown by pulsed lased deposition (PLD) was also studied, and they were excellent gas sensors. (Paper 5, two additional papers in the pipeline).

5.1.8. ZnO and TiO_2 nanofilms were deposited by ALD onto a QCM (quartz crystal microbalance) gas sensor, and it was shown that already ultrathin (10-16 nm) oxide films had gas sensitivity (Papers 20, 37).
5.1.9. TiO_2/ZnO and ZnO/TiO_2 core/shell nanofibers were prepared by electrospinning and ALD and applied for gas sensing and photocatalysis. (Paper 6).
5.1.10. The electrochromic properties of WO_3 thin films prepared by matrix assisted pulsed laser evaporation (MAPLE) and that of sputter-deposited and WO_3-MoO_3 thin films were analyzed (Papers 8, 18).
5.1.11. A review paper was published on ALD and CVD (chemical vapor deposition) prepared photocatalytic and electrochromic metal oxide thin films (Paper 30).
5.1.12. A review paper was published on one-dimensional nanostructures prepared by electrospinning and atomic layer deposition, which included several photocatalytic core/shell 1D nanostructures, e.g. WO_3/TiO_2 nanofibers (Paper 36).

5.2.1. Additional results

5.2.1. The thermal behavior of ammonium molybdates and tungstates was analyzed. A new solid-gas phase preparation route was developed for the preparation of ammonium paratungstate and amine-WO_3 hybrid structures. The WO_3-amine hybrids were used as catalysts (Papers 8, 11, 12, 24, 25, 33, 38).
5.2.2. ALD TiO_2 nanofilm coated porous MCP (multi-channel plate) Kapton membranes were obtained to be used in electron detection (Paper 21).
5.2.3. Li and Ni doped ZnO was obtained to be used in TCO (transparent conductive oxide) films (Paper 27).
5.2.4. The fire resistance of cement and concrete materials was investigated (Papers 9, 10, 23).
5.2.5. Several metalorganic Pt, Fe, Co, Ni, Cu, Zn complexes were synthesized and characterized (Papers 11, 13, 14, 34, 41).
4.2.6. Various diastereomeric salt precipitation and racemate mixture resolving processes were studied (Paper 12, 19, 40).
5.2.7. The influence of KBr on the thermal behavior of ammonia borane studied (Paper 15).
5.2.8. Surface enhanced Raman chemical imaging of low drug concentration in model formulations was performed (Paper 32).
5.2.9. Silver doped antibacterial textiles were analyzed (Paper 33).
5.2.10. The PI was opponent at 2 PhD defenses, board member at 4 PhD defenses, he reviewed 94 international journal papers, and he was also reviewer of several BSc, MSc diploma theses, OTDK (national TDK) papers and several grant proposals.
5.2.11. The PI was invited to be Editor-in-Chief (2017-) and Deputy Editor-in-Chief (2014-2016) at the Journal of Thermal Analysis and Calorimetry. He already worked here as an associate editor between 2012 and 2013. The journal is a leader in its field (IF: 1.953). The PI was also invited to be Editorial Board member at the Journal of Thermal Engineering (2015-), European Chemical Bulletin (2014-), Associate Editor at ScienceJet (Nanoscience and Nanotechnology Section, 2015-), and Honorary editor at the Journal of Heat and Mass Transfer Research (2018-).
5.2.12. The PI was Chair of the 1st Journal of Thermal Analysis and Calorimetry and 6th V4 (Joint Czech–Hungarian–Polish–Slovakian) Thermoanalytical Conference (JTACC+V4, Budapest, Hungary, 6–9 June, 2017). The PI was member of the scientific committee at the Central and Eastern European Conference on Thermal Analysis and Calorimetry CEEC-TAC3, 25-28 August 2015, Ljubljana, Slovenia.

Publication list of the OTKA PD-109129 grant

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The publication list is available online:
https://vm.mtmt.hu//search/slist.php?lang=0&AuthorID=10018790
and
http://scholar.google.com/citations?user=cyv2GzUAAAAJ&hl=en

Summary

- 41 international journal papers
- 99 conference presentations (14 plenary/invited lectures, 61 oral and 24 poster presentations)
- Sum of impact factors: 68.574

International journal papers

1. Nóra Justh, László Péter Bakos, Klára Hernádi, Gabriella Kiss, Balázs Réti, Zoltán Erdélyi, Bence Parditka, Imre Miklós Szilágyi: Photocatalytic hollow TiO_2 and ZnO nanospheres prepared by atomic layer deposition.
   Scientific Reports, **2017,** 7, 4337.

2. Nóra Justh, Tamás Firkala, Krisztina László, János Lábár, Imre Miklós Szilágyi: Photocatalytic C_{60}-amorphous TiO_2 composites prepared by atomic layer deposition.
   Applied Surface Science, **2017,** 419, 497-502

3. Teodóra Nagyné Kovács, György Pokol, Fanni Gáber, Dávidné Nagy, Tamás Igricz, István Endre Lukács, Zsolt Fogarassy, Katalin Balázsi, Imre M. Szilágyi: Preparation of iron tungstate ($FeWO_4$) nanosheets by hydrothermal method.
   Materials Research Bulletin, **2017,** 95, 563-569.

4. Tamás Firkala, Orsolya Kéri, Fanni Gáber, Lenke Kócs, Dávidné Nagy, Zoltán Hórvölgyi, Maria Zaharescu, Imre Miklós Szilágyi: Photocatalytic properties of hexagonal WO_3 nanowires decorated with gold nanoparticles.
   Revue Roumaine de Chimie, **2017,** 62, 767-773.

5. Stefan I. Boyadjiev, Velichka Georgieva, Nicolaie Stefan, George E. Stan, Floralice M. Miroiu, Natalia Mihailescu, Anita Visan, Ion N. Mihailescu, Cristina Besleaga, Imre M. Szilágyi: Characterization of PLD grown WO_3 thin films for gas sensing.
   Applied Surface Science, **2017,** 417, 218-223.

6. Stefan I. Boyadjiev, Orsolya Kéri, Péter Bárdos, Tamás Firkala, Fanni Gáber, Zsombor K. Nagy, Zsófia Baji, Máté Takács, Imre M. Szilágyi: TiO_2/ZnO and ZnO/TiO_2 nanofibers prepared by electrospinning and atomic layer deposition (ALD) for gas sensing and photocatalysis.
   Applied Surface Science, **2017,** 424, 190-197.

7. Dávid Hunyadi, Eszter Majzik, Judit Mátyási, József Balla, Attila Domján, Ágnes Szegedi, Imre Miklós Szilágyi: WO_3-EDA hybrid nanoplates and nanowires: Synthesis, characterization, formation mechanism and thermal decomposition.
   RSC Advances, **2017,** 7, 46726-46737.

8. S I Boyadjiev, N Stefan, I M Szilágyi, N Mihailescu, A Visan, I N Mihailescu, G E Stan, C Besleaga, M T Iliev, K A Gesheva: Characterization of MAPLE deposited WO_3 thin films for electrochromic applications. *Journal of Physics Conference Series* **2017,** 780, 012013

9. Olivér Czoboly, Éva Lublóy, Viktor Hlavička, György L. Balázs, Orsolya Kéri, Imre Miklós Szilágyi: Fibers and fiber cocktails to improve fire resistance of concrete. *Journal of Thermal Analysis and Calorimetry*, **2017,** 128, 1453-1461.

10. Éva Lublóy, Katalin Kopecskó, György L. Balázs, Ágoston Restás, Imre M. Szilágyi: Impoved fire resistance by using Portland-pozzolana of Portland fly-ash cements. *Journal of Thermal Analysis and Calorimetry*, **2017,** 129, 925-936.

11. B. Barta Holló, I. M. Szilágyi, Cs. jr. Várhelyi, D. Hunyadi, R.I. Nagy, N.G. Tihi, F. Goga, J. Papp, R. Szalay, G. Pokol: Synthesis, physico-chemical characterization and bacteriostatic study of Pt complexes with substituted amine ligands. *Journal of Thermal Analysis and Calorimetry*, **2017,** 127, *1733-1741.*

12. Amit Zodge, Márton Kőrösi, János Madarász, Imre Miklós Szilágyi, Tamás Sohajda, Edit Székely: GAS Antisolvent precipitation of 4-chloromendelic acod with phenylethylamine and cyclohexylethylamine. *Chemical and Biochemical Engineering Quarterly*, **2017,** 31, 335–341.

13. Cs. Várhelyi Jr.; A. Lengyel; Z. Homonnay; R. Szalay; Gy. Pokol; I. M. Szilágyi; P. Huszthy; J. Papp; F. Goga; L.-M. Golban; M. Várhelyi; M. Tomoaia-Cotisel; Á. Szőke; E. Kuzmann: Mössbauer study of novel iron(II) complexes synthesized with Schiff bases. *Hyperfine Interactions*, **2017,** 238, 87.

14. ifj. Várhelyi Csaba, Kuzmann Ernő, Homonnay Zoltán, Pokol György, Szilágyi Imre Miklós, Huszthy Péter, Szalay Roland, Papp Judit, Goga Firuţa, Golban Ligia-Mirabela, Várhelyi Melinda: Synthesis of Fe(II)-complexes with Schiff bases, physical chemical and biological activity study. *Acta Scientiarum Transylvanica Chimica*, **2017,** 25, 28-35.

15. Biliškov, Nikola; Vojta, Danijela; Kótai, László; Szilágyi, Imre Miklós; Hunyadi, Dávid; Pasinszki, Tibor; Flinčec Grgac, Sandra; Borgschulte, Andreas; Zuttel, Andreas: High Influence of Potassium Bromide on Thermal Decomposition of Ammonia Borane. *Journal of Physical Chemistry C*, **2016,** 120 (44), 25276–25288.

16. L. P. Bakos, N. Justh, K. Hernádi, G. Kiss, B. Réti, Z. Erdélyi, B. Parditka, I. M. Szilágyi: Core-shell carbon nanosphere-TiO_2 composite and hollow TiO_2 nanospheres prepared by atomic layer deposition. *Journal of Physics Conference Series* **2016,** 764, 012005.

17. Dávidné Nagy, Tamás Firkala, Eszter Drotár, Ágnes Szegedi, Krisztina László, Imre Miklós Szilágyi: Photocatalytic WO_3/TiO_2 nanowires: WO_3 polymorphs influencing the atomic layer deposition of TiO_2. *RSC Advances*, **2016,** 6, 95369-95377.

18. K. Gesheva, M. Arvizu, G. Bodurov, T. Ivanova, G. Niklasson, M. Iliev, T. Vlakhov, P. Terzijska, G. Popkirov, S. Boyadjiev, G. Jägerszki, I.M. Szilágyi, Y. Marinov: Optical, structural and electrochromic properties of sputter-deposited W-Mo oxide thin films. *Journal of Physics Conference Series* **2016,** 764 012010

19. László Lőrincz, György Bánsághi, Máté Zsemberi, Sandra de Simón Brezmes, Imre Miklós Szilágyi, János Madarász, Tamás Sohajda, Edit Székely: Diastereomeric salt precipitation based resolution of ibuprofen by gas antisolvent method. *The Journal of Supercritical Fluids*, **2016,** 118, 48-53

20. S. Boyadjiev, V. Georgieva, R. Yordanov, Z. Raicheva, I. M. Szilágyi: Preparation and characterization of ALD deposited ZnO thin films studied for gas sensors. *Applied Surface Science*, **2016,** 387, 1230-1235.

21. Laura Mättö, Imre Miklós Szilágyi, Mikko Laitinen, Mikko Ritala, Markku Leskelä, Timo Sajavaara: Coating and functionalization of high density ion track structures by atomic layer deposition. *Nuclear Instruments and Methods in Physics Research A*, **2016,** 832, 254-258.

22. Dávidné Nagy, Dávid Nagy, Imre Miklós Szilágyi, Xianfeng Fan: Control of the Morphology and Phases in Nanocrystalline WO_3 Synthesis and Their Effect on the Band Gap. *RSC Advances,* **2016,** 6, 33743-33754

23. Éva Lublóy, Katalin Kopecskó, György L. Balázs, Imre Miklós Szilágyi, János Madarász: Improved fire resistance by using slag cements. *Journal of Thermal Analysis and Calorimetry*, **2016,** 125, 271-279.

24. Teodóra Nagyné Kovács, Dávid Hunyadi, Alex Leandro Andrade de Lucena, Imre Miklós Szilágyi: Thermal decomposition of ammonium molybdates. *Journal of Thermal Analysis and Calorimetry*, **2016,** 124 (2):1013-1021

25. Dávid Hunyadi, Imre Miklós Szilágyi, Attila L. Tóth, Eszter Drotár, Tamás Igricz, György Pokol: An alternative solid-gas phase synthesis route for ammonium paratungstate. *Inorganica Chimica Acta*, **2016,** 444, 29-36.

26. Dávidné Nagy, Imre Miklós Szilágyi, Tamás Firkala, Xianfeng Fan: Study about the morphology effect on the photo-efficiency of WO_3. *European Chemical Bulletin*, **2016,** 5(2), 40-42.

27. Suzana Mihaiu, Imre Miklós Szilágyi, Irina Atkinson, Oana Catalina Mocioiu, Dávid Hunyadi, Jeanina Pandele-Cusu, Alexandra Toader, Cornel Munteanu, Stefan Boyadjiev, János Madarász, György Pokol, Maria Zaharescu: Thermal study on the synthesis of the doped ZnO to be used in TCO films. *Journal of Thermal Analysis and Calorimetry*, **2016,** 124, 71-80.

28. Stefan I Boyadjiev, Gustavo dos Lopes Santos, Júlia Szűcs, Imre Miklós Szilágyi. Preparation and characterization of WO_3 nanoparticles, WO_3/TiO_2 core/shell nanocomposites and PEDOT:PSS/WO_3 composite thin films for photocatalytic and electrochromic applications. *American Institute of Physics - Conference Proceedings*, **2016,** 1722, 140004

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30. K Gesheva, T Ivanova, G Bodurov, I M Szilágyi, N Justh, O Kéri, S Bojadjiev, D Nagy and M Aleksandrova. Technologies for deposition of transition metal oxide thin films: application as functional layers in "Smart windows" and photocatalytic systems. *Journal of Physics – Conference Series,* **2016,** 682, 012011

31. S Boyadjiev**,** B Manduca, Júlia Szűcs, I M Szilágyi. WO_3 nanopaticles and PEDOT:PSS/WO_3 composite thin films studied for photocatalytic and electrochromic applications. *Journal of Physics – Conference Series,* **2016,** 700, 012019

32. Tamás Firkala, Attila Farkas, Balázs Vajna, Zsombor Kristóf Nagy, György Pokol, György Marosi, Imre Miklós Szilágyi: Quantification of low drug concentration in model formulations with multivariate analysis using surface enhanced Raman chemical imaging. *Journal of Pharmaceutical and Biomedical Analysis*, **2015,** 107, 318-324.

33. Dávid Hunyadi, Ana Luisa Vieira Machado Ramos, Imre Miklós Szilágyi: Thermal decomposition of ammonium tetrathiotungstate *Journal of Thermal Analysis and Calorimetry*, **2015,** 120, 209-215.

34. Ivan Ristić, Berta Barta Holló, Jaroslava Budinski-Simendić, Katalin Mészáros Szécsényi, Suzana Cakić, Imre Miklós Szilágyi, György Pokol: Synthesis of novel metal containing epoxy polymers and their

structural characterization by means of FT-IR and coupled TG/MS measurements
Journal of Thermal Analysis and Calorimetry, **2015,** 119, 1011-1021.

35. Ásványi Balázs, Dudás Tünde, Stefan Ivanov Boyadjiev, Szilágyi Imre Miklós. Ezüstözött textíliák vizsgálata ezüst leválasztásának módszerével.
Magyar Textiltechnika, **2015,** 3, 15-20

36. Imre Miklós Szilágyi, Dávidné Nagy: Review on one-dimensional nanostructures prepared by electrospinning and atomic layer deposition.
Journal of Physics – Conference Series, **2014,** 559, 012010

37. S. Boyadjiev, V. Georgieva, L. Vergov, Z. Baji, F. Gáber, I. M. Szilágyi: Gas sensing properties of very thin TiO_2 films prepared by atomic layer deposition (ALD).
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38. Dávid Hunyadi, István Sajó, Imre Miklós Szilágyi: Structure and thermal decomposition of ammonium metatungstate.
Journal of Thermal Analysis and Calorimetry, **2014,** 116, 329-337.

39. Tamás Firkala; Balázs Fórizs; Eszter Drotár; András Tompos; Attila L. Tóth; Katalin Varga-Josepovits; Krisztina László; Markku Leskelä; Imre Miklós Szilágyi: Influence of the support crystal structure of Au/WO_3 catalysts in CO oxidation.
Catalysis Letters, **2014**, 144 (5) 831-836

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Chemical Engineering Technology, **2014,** 37 (8), 1417-1421.

41. Berta Holló; József Magyari; Vukosava Živković-Radovanović; Gordana Vučković; Zoran D Tomić; Imre Miklós Szilágyi; György Pokol; Katalin Mészáros Szécsényi: Synthesis, characterization and antimicrobial activity of bis(phthalazine-1-hydrazone)-2,6-diacetylpyridine and its complexes with Co^{III}, Ni^{II}, Cu^{II} and Zn^{II}.
Polyhedron, **2014,** 80, 142-150

Conference presentations – plenary and invited lectures

1. I.M. Szilágyi: Thermal analysis in materials science. *XXI International Conference on Chemical Thermodynamics in Russia (RCCT-2017),* 26-30 June, **2017,** Novosibirsk, Russia (invited lecture)
2. I. M. Szilágyi: Influence of the crystal structure and composition of nanosize WO_3 on the gas sensing, photocatalytic and catalytic properties. *International Conference of Physical Chemistry – ROMPHYSCHEM 17th,* 21-23 September **2016,** Galati, Romania (keynote lecture)
3. D. Hunyadi, E. Majzik, I. M. Szilágyi: Solid-gas phase synthesis of ammonium paratungstate and amine-WO_3 hybrid catalysts. *International Conference of Physical Chemistry – ROMPHYSCHEM 17th,* 21-23 September **2016,** Galati, Romania (keynote lecture)
4. O. Kéri, E. Kocsis, L. Kócs, L. Kárpáti, Zs. Baji, B. Parditka, Z. Erdélyi, I.M. Szilágyi: Photocatalytic properties of ALD coated polymer and inorganic nanostructures. *International Conference of Physical Chemistry – ROMPHYSCHEM 17th,* 21-23 September **2016,** Galati, Romania (keynote lecture)
5. Teodora Nagyne Kovacs, Istvan Lukacs, Imre Miklos Szilagyi, Gyorgy Pokol: Preparation of photocatalytic iron tungstate ($FeWO_4$) nanosheets and h-WO_3 nanorods by hydrothermal method. *International Conference of Physical Chemistry – ROMPHYSCHEM 17th,* 21-23 September **2016,** Galati, Romania (keynote lecture)
6. N. Justh, K. László, B. Berke, B. Nagy, G. Mikula, L. Bakos, Z. Erdélyi, B. Parditka, Zs. Baji, K. Hernádi, G. Kiss, B. Réti, I. M. Szilágyi: Atomic layer deposition of semiconductor oxides on carbon nanomaterials. *International Conference of Physical Chemistry – ROMPHYSCHEM 17th,* 21-23 September **2016,** Galati, Romania (keynote lecture)
7. Imre Miklós Szilágyi: Thermal analysis in Materials Science. *International Confederation for Thermal Analysis and Calorimetry (ICTAC) Congress,* 14-19 August **2016,** Orlando, USA (keynote lecture)
8. Imre Miklós Szilágyi, Nóra Justh, Orsolya Kéri, Boyadjiev Stefan: Atomi réteg leválasztással előállított nanoszerkezetű fotokatalizátorok. [Nanostructured photocatalysts prepared by atomic layer deposition.] *Új*

távlatok a kémiában, a fény szerepe a kémiai reakciókban című előadóülés, Magyar Tudomány Ünnepe [Meeting about New perspectives in chemistry, the role of light in chemical reactions, Celebration of Hungarian Science], 25 November **2015,** Szeged, Hungary (invited lecture)

9. Imre Miklós Szilágyi: ALD in nanotechnology. *Training Seminar "INERA Delivered Equipments: Technologies & Characterization" – part 2,* 5-7 October **2015,** Sofia, Bulgaria (invited lecture)
10. Imre Miklós Szilágyi: Formation, structure and application of tungsten oxides. Use of combined and coupled thermal analytical techniques. *12th Conference on Calorimetry and Thermal Analysis (CCTA 12) and 5th Joint Czech - Hungarian - Polish – Slovakian Thermoanalytical Conference,* 6-10 September **2015,** Zakopane, Poland (invited lecture)
11. Imre Miklós Szilágyi: Thermal behaviour of tungstates, tungsten oxides and tungsten bronzes. *Central and Eastern European Conference on Thermal Analysis and Calorimetry CEEC-TAC3,* 25-28 August **2015,** Ljubljana, Slovenia (invited lecture)
12. Imre Miklós Szilágyi: Thermal analysis in materials science. *VII Simposie de Análise Térmica/VII Symposium of Thermal Analysis,* 19-21 July **2015,** Bauru, Brazil (plenary lecture)
13. Imre Miklós Szilágyi: Nanostructured photocatalysts prepared by atomic layer deposition (ALD). *University of Edinburgh, School of Engineering, Seminar,* 15 January **2015,** Edinburgh, Scotland (invited lecture)
14. I.M. Szilágyi: Nanostructured photocatalysts prepared by atomic layer deposition. *INERA WORKSHOP Transition Metal Oxide Thin Films-functional Layers in "Smart windows" and Water Splitting devices: Technology and Optoelectronic properties* 4-6 September **2014,** Varna, Bulgaria (invited lecture)

Conference presentations – lectures

1. Nagyné Kovács Teodóra,Studnicka Levente, Spengler Gabriella, Pokol György, Szilágyi Imre Miklós: Stronciummal és magnéziummal adalékolt hidroxiapatitok előállítása és vizsgálata. [Preparation and analysis and strontium and magnesium doped hydroxyapatite.] *„PhD hallgatók anyagtudományi napja XVII" - MTA Anyagtudományi és Szilikátkémiai Munkabizottság ülése [Meeting of the Materials Science and Silicate Chemistry Work Group of the Hungarian Academy of Sciences],* 4 December **2017,** Veszprém, Hungary
2. Nagy Dávidné, Maria-Chiara Ferrari, Szilágyi Imre Miklós, Neil Robertson: TiO_2/Cu_2O kompozit nanofilmek fotokatalitikus aktivitásának vizsgálata. [Invesigating the photocatalytic activity of TiO_2/Cu_2O composite nanofilms.] *„PhD hallgatók anyagtudományi napja XVII" - MTA Anyagtudományi és Szilikátkémiai Munkabizottság ülése [Meeting of the Materials Science and Silicate Chemistry Work Group of the Hungarian Academy of Sciences],* 4 December **2017,** Veszprém, Hungary
3. Nagyné Kovács Teodóra, Studnicka Levente, Spengler Gabriella, Pokol György, Szilágyi Imre Miklós: Stronciummal és magnéziummal adalékolt hidroxiapatitok előállítása és vizsgálata. [Preparation and analysis and strontium and magnesium doped hydroxyapatite.] *XL. Kémiai Előadói Napok, [XL. Chemical Lecture Days]*, 16-18 October **2017,** Szeged, Hungary
4. O. Kéri, E. Kocsis, L. Kócs, Z. Hórvölgyi, L. Kárpáti, B. Parditka, Z. Erdélyi, I.M. Szilágyi: Preparation and investigation of the photocatalytic properties of core/shell nanocomposites. *19th Annual Conference of the Materials Research Society of Serbia (YUCOMAT 2017),* September 4–8, **2017,** Hercegi Novi, Montenegro
5. Teodóra Nagyné Kovács, György Pokol, Fanni Gáber, Dávidné Nagy, Tamás Igricz, István Endre Lukács, Zsolt Fogarassy, Katalin Balázsi, Imre M. Szilágyi: Preparation of iron tungstate (FeWO4) nanosheets by hydrothermal method. *19th Annual Conference of the Materials Research Society of Serbia (YUCOMAT 2017),* September 4–8, **2017,** Hercegi Novi, Montenegro
6. László Péter Bakos, Nóra Justh, Klára Hernádi, Gabriella Kiss, Balázs Réti, Zoltán Erdélyi, Bence Parditka, Imre Miklós Szilágyi: Photocatalytic hollow TiO_2 and ZnO nanospheres prepared by atomic layer deposition. *19th Annual Conference of the Materials Research Society of Serbia (YUCOMAT 2017),* September 4–8, **2017,** Hercegi Novi, Montenegro
7. Stefan I. Boyadjiev, Nicolaie Stefan, George Stan, Miguel Arvizu, Imre M. Szilágyi, Anita Visan, Natalia Mihailescu, Ion N. Mihailescu, Cristina Besleaga, Lars Österlund, Kostadinka A. Gesheva: Study of the electrochromic properties of MAPLE and PLD deposited WO_3 thin films. 21st International Conference of Solid State Ionics (SSI-21). 18-23 June **2017,** Padua, Italy
8. Dávid Hunyadi, Eszter Majzik, Judit Mátyási, József Balla, Attila Domján, Ágnes Szegedi, Imre Miklós Szilágyi: WO_3-EDA hybrid catalyst: Synthesis, characterization and thermal decomposition. *1st Journal of Thermal Analysis and Calorimetry and 6th V4 (Joint Czech–Hungarian–Polish–Slovakian) Thermoanalytical Conference (JTACC+V4),* 6–9 June, **2017,** Budapest, Hungary
9. Cristina M. Vladut, Susana Mihaiu, Imre M. Szilágyi, Teodóra Nagyné Kovács, Irina Atkinson, Oana C. Mocioiu, Jeanina Pandele-Cusu, Simona Petrescu, Maria Zaharescu: Thermal investigation on the Sn-Zn-O

gels obtained by sol-gel method. *1st Journal of Thermal Analysis and Calorimetry and 6th V4 (Joint Czech–Hungarian–Polish–Slovakian) Thermoanalytical Conference (JTACC+V4),* 6–9 June, **2017,** Budapest, Hungary

10. Luminita Predoana, Irina Atkinson, Imre M. Szilágyi, Teodóra Nagyné Kovács, Jeanina Pandele Cusu, Simona Petrescu, Adriana Rusu, Maria Zaharescu: Thermal behaviour of the Cu-Sr-O gels obtained by sol-gel method. *1st Journal of Thermal Analysis and Calorimetry and 6th V4 (Joint Czech–Hungarian–Polish–Slovakian) Thermoanalytical Conference (JTACC+V4),* 6–9 June, **2017,** Budapest, Hungary
11. Imre Miklós Szilágyi: Formation, stability and application of tungstates, tungsten oxides and tungsten bronzes. *19th Plansee Seminar,* 29 May – 2 June **2017,** Reutte, Austria
12. Dávidné Nagy, Maria-Chiara Ferrari, Imre Miklós Szilágyi, Xianfeng Fan: Effect of Ag Co-catalyst on TiO_2-Cu_2O Nanocomposites Structure and Visible Photocatalytic Activities. *EMRS Spring,* 22-26 May **2017,** Strasbourg, France
13. László Péter Bakos, Joshua Mensah, Krisztina László, Imre Miklós Szilágyi: Preparation and characterization of nitrogen doped mesoporous carbon aerogels. *14th International Conference "Students for Students,* 25-30 April **2017,** Kolozsvár [Cluj], Romania
14. Dávidné Nagy, Ferrari Maria-Chiara, Fan Xianfeng, Imre Miklós Szilágyi: Fotokatalitikus WO_3, TiO_2, Cu_2O nanoszerkezetek előállítása hidrotermális és szol-gél eljárással. [Preparation of photocatalytic WO_3, TiO_2, Cu_2O nanostructures by hydrothermal and sol-gel snythesis.] *MTA Anyagtudományi és Szilikátkémiai Munkabizottság és az MKE Kolloidkémiai és Nanotechnológiai Szakosztály együttes ülése [Joint meeting of the Materials Science and Silicate Chemistry Work Group of the Hungarian Academy of Sciences and the Colloid Chemistry and Nanotechnology Department of the Hungarian Chemical Society],* 09 January **2017,** Budapest, Hungary
15. Eszter Kocsis, Orsolya Kéri, Bence Parditka, Zoltán Erdélyi, Zsombor Kristóf Nagy, Tamás Igricz, Imre Miklós Szilágyi: Polimer/fém-oxid nanoszálak és fém-oxid nanocsövek előállítása és vizsgálata. [Preparation and analysis of polymer/oxide nanowires and metal oxide nanotubes.] *MTA Anyagtudományi és Szilikátkémiai Munkabizottság és az MKE Kolloidkémiai és Nanotechnológiai Szakosztály együttes ülése [Joint meeting of the Materials Science and Silicate Chemistry Work Group of the Hungarian Academy of Sciences and the Colloid Chemistry and Nanotechnology Department of the Hungarian Chemical Society],* 09 January **2017,** Budapest, Hungary
16. Gergő János Mikula, Nóra Justh, Krisztina László, Balázs Nagy, Zoltán Erdélyi, Bence Parditka, Tamás Igricz, Imre Miklós Szilágyi: Aerogél/TiO_2 kompozitok létrehozása atomi rétegleválasztással. [Preparation of aerogel/TiO_2 composites with atomic layer deposition.] *MTA Anyagtudományi és Szilikátkémiai Munkabizottság és az MKE Kolloidkémiai és Nanotechnológiai Szakosztály együttes ülése [Joint meeting of the Materials Science and Silicate Chemistry Work Group of the Hungarian Academy of Sciences and the Colloid Chemistry and Nanotechnology Department of the Hungarian Chemical Society],* 09 January **2017,** Budapest, Hungary
17. Ifj. Csaba Várhelyi, Ernő Kuzmann, Zoltán Homonnay, Renáta Ildikó Nagy, György Pokol, Imre Miklós Szilágyi, Péter Huszthy, Rolan Szalay, Judit Papp, Firuta Goga, Ligia Mirabela Golban, Melinda Várhelyi: Schiff-bázisokkal képzett vas(II)-komplexek szintézise, fizikai-kémiai és biológiai aktivitásuk vizsgálata. [Synthesis, physical chemistry and biological activity of iron(II) Schiff complexes]. *Erdélyi Természettudományi Konferencia 2016 [Transylvanian Scientific Conference 2016],* 26 November, **2016,** Kolozsvár (Cluj), Romania
18. Lőrincz László, Bánsághi György, Szilágyi Imre Miklós, Madarász János, Kózelné Székely Edit: Ibuprofén reszolválása gáz antiszolvens módszerrel. [Resolving ibuprofen with the gas antisolent method.] *XXXIX. Kémiai Előadói Napok, [XXXVIII Chemical Lecture Days],* 17-19 October **2016,** Szeged, Hungary
19. Bakos László Péter, Justh Nóra, Hernádi Klára, Kiss Gabriella, Réti Balázs, Erdélyi Zoltán, Parditka Bence, Szilágyi Imre Miklós: Mag/héj és üreges szén nanogömb/fém-oxid nanokompozitok. [Core/shell and hollow carbon nanosphere/metal oxide nanocomposites.] *XXXIX. Kémiai Előadói Napok, [XXXIX. Chemical Lecture Days],* 17-19 October **2016,** Szeged, Hungary
20. Stefan Boyadjiev, Kostadinka Gesheva, Bruno Manduca, Orsoya Kéri, Péter Bárdos, Imre M. Szilágyi: Transition metal oxides ultra-thin films and core-shell nanocomposites prepared by atomic layer deposition for photocatalytic and electrochromic applications. *1st International conference on Advanced Energy Materials (AEM2016), 2nd International conference on Hydrogen Energy, 8th International conference on Advanced Nanomaterials,* September 12-14, **2016,** Surrey, UK
21. S. I. Boyadjiev, K. A. Gesheva, I. M. Szilágyi: Preparation of WO_3/TiO_2 core/shell nanocomposites by controlled annealing and atomic layer deposition for electrochromic applications. *2016 INERA Conference "Vapor Phase Technologies for metal oxide and carbon nanostructures",* 5–9 July **2016,** Velingrad, Bulgaria
22. S. I. Boyadjiev, I. M. Szilágyi, N. Serban, A. Visan, N. Stefan, I. N. Mihailescu, M. Zaharescu, K. A. Gesheva: Characterization of PLD and MAPLE deposited WO_3 thin films for electrochromic applications.

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23. O. Kéri, E. Kocsis, L. Kócs, L. Kárpáti, Zs. Baji, B. Parditka, Z. Erdélyi, I.M. Szilágyi: ALD on polymers and inorganic nanoparticles. *2016 INERA Conference "Vapor Phase Technologies for metal oxide and carbon nanostructures",* 5–9 July **2016,** Velingrad, Bulgaria
24. N. Justh, K. László, B. Berke, B. Nagy, G. Mikula, L. Bakos, I. M. Szilágyi, Z. Erdélyi, B. Parditka, Zs. Baji: Preparation of carbon nanomaterial/semiconductor oxide composites by atomic layer deposition. *2016 INERA Conference "Vapor Phase Technologies for metal oxide and carbon nanostructures",* 5–9 July **2016,** Velingrad, Bulgaria
25. Dávid Hunyadi, Eszter Majzik, Imre Miklós Szilágyi: Solid-gas phase synthesis of ammonium paratungstate and amine-WO_3 hybrid catalysts. *2016 INERA Conference "Vapor Phase Technologies for metal oxide and carbon nanostructures",* 5–9 July **2016,** Velingrad, Bulgaria
26. Dávid Hunyadi, Imre Miklós Szilágyi: Polivolframátok fázisátalakulásai [Phase transitions of polytungstates]. *BME-VBK Oláh György Doktori Iskola XIII. konferenciája [XIII Conference of the George Olah PhD School, Faculty of Chemical Technology and Biotechnology, Budapest University of Technology]*. 11 February **2016,** Budapest, Hungary
27. Orsolya Kéri, Imre Miklós Szilágyi: Elektrosztatikus szálhúzással előállított oxid nanoszálak termikus jellemzése. [Thermoanalytical characterization of electrospun oxide nanofibers.] MKE Termoanalitikai Szakcsoport – Termoanalitikai Szeminárium, [*Thermoanalytical Group of the Hungarian Chemical Society – Thermoanalytical Seminar],* 27 November **2015,** Pécs, Hungary
28. Teodóra Kovács, Dávid Hunyadi, Imre Miklós Szilágyi: Ammónium-molibdátok termikus viselkedése. [Thermal behavior of ammonium molybdates.] MKE Termoanalitikai Szakcsoport – Termoanalitikai Szeminárium, [*Thermoanalytical Group of the Hungarian Chemical Society – Thermoanalytical Seminar],* 27 November **2015,** Pécs, Hungary
29. Orsolya Kéri, Imre Miklós Szilágyi, Tamás Firkala, Fanni Gáber, Dávidné Nagy, Lenke Kócs, Zoltán Hórvölgyi: Arany nanoszemcsékkel adalékolt hexagonális WO_3 nanoszálak fotokatalitikus tulajdonságai. [Photocatalytic properties of hexagonal WO_3 nanofibers necorated with gold nanoparticles.] *XXXVIII. Kémiai Előadói Napok, [XXXVIII Chemical Lecture Days],* 26-28 October **2015,** Szeged, Hungary
30. Teodóra Kovács, Imre Miklós Szilágyi, István Lukács: Vas-volframát ($FeWO_4$) nanolemezek előállítása hidrotermális eljárással. [Preparation of iron tungstate ($FeWO_4$) nanosheets by hydrothermal synthesis.] *XXXVIII. Kémiai Előadói Napok, [XXXVIII Chemical Lecture Days],* 26-28 October **2015,** Szeged, Hungary
31. Nóra Justh, Imre Miklós Szilágyi, Krisztina László, Barbara Berke: Fotokatalitikus grafén-oxid (GO) nanokompozitok előállítása. [Preparation of photocatalytic graphene opxide (GO) nanocomposites.] *XXXVIII. Kémiai Előadói Napok, [XXXVIII Chemical Lecture Days],* 26-28 October **2015,** Szeged, Hungary
32. Imre Miklós Szilágyi*:* Photocatalytic properties of crystalline and amorphous ALD TiO_2 thin films. *Baltic ALD 2015 Conference* 28-29 September **2015,** Tartu, Estonia
33. Amit Zodge, Márton Kőrösi, Máté Tárkányi, Dávid Hunyadi, Petra Bombicz, János Madarász, Imre Miklós Szilágyi, Tamás Sohajda and Edit Székely: Enantioselective diastereomeric salt precipitation of 2-Methoxyphenylacetic acid using (R)-1-Cyclohexylethyl-amine with supercritical carbon dioxide. *10th European Congress of Chemical Engineering,* 27 Sept - 1 Oct **2015,** Nice, France
34. S. Boyadjiev, V. Georgieva, I. M. Szilágyi: WO_3 nanoparticles and WO_3/TiO_2 core-shell nanocomposites prepared by annealing and atomic layer deposition (ALD) for gas sensing, photocatalytic and electrochromic applications. *Nineteenth International Summer School on Vacuum, Electron and Ion Technologies,* 21 - 25 September **2015,** Sozopol, Bulgaria
35. Imre Miklós Szilágyi, Nóra Justh, Tamás Firkala, Krisztina László, János Lábár: Preparation of fullerene (C_{60})-TiO_2 nanocomposites by atomic layer deposition (ALD). *12th Conference on Calorimetry and Thermal Analysis (CCTA 12) and 5th Joint Czech - Hungarian - Polish – Slovakian Thermoanalytical Conference,* 6-10 September **2015,** Zakopane, Poland
36. S.I. Boyadjiev, P. Bárdos, Z. Nagy, I.M. Szilágyi: ZnO/TiO_2 and TiO_2/ZnO nanofibers prepared by electrospinning and atomic layer deposition (ALD) for photocatalysis and gas sensing. *9th International Physics Conference of the Balkan Physical Union – BPU9,* 24-27 August **2015,** Istanbul, Turkey
37. S.I. Boyadjiev, V.B. Georgieva, I.M. Szilágyi: Preparation and characterization of composite thin films of PEDOT:PSS and WO_3 nanopaticles and WO_3/TiO_2 core/shall nanocomposites for gas sensing, photocatalytic and electrochromic applications. *9th International Physics Conference of the Balkan Physical Union – BPU9,* 24-27 August **2015,** Istanbul, Turkey
38. Alex Leandro Andrade de Lucena,Dávid Hunyadi, Imre Miklós Szilágyi: Thermal decomposition of ammonium molybdate tetrahydrate, $(NH_4)_6Mo_7O_{24}{\cdot}4H_2O$. *12th International Conference "Students for Students,* 22-26 April **2015,** Kolozsvár [Cluj], Romania

39. Fanni Fekete, Imre Miklós Szilágyi, László Kótai: The investigation of zinc-ferrite recyclization from hot-dip galavanization sludge**.** *11th International Conference "Students for Students,* 22-26 April **2015,** Kolozsvár [Cluj], Romania
40. Fanni Gáber, Imre Miklós Szilágyi: Modification of biological surfaces by atomic layer deposition **.** *11th International Conference "Students for Students,* 22-26 April **2015,** Kolozsvár [Cluj], Románia
41. Nóra Justh, Imre Miklós Szilágyi, Tamás Firkala, Krisztina László, Zsófia Baji, János Lábár: Preparation of fullerene (C_{60})-TiO_2 nanocomposite by atomic layer deposition. *11th International Conference "Students for Students,* 22-26 April **2015,** Kolozsvár [Cluj], Romania
42. Orsolya Kéri, Imre Miklós Szilágyi, Lenke Kócs, Zsófia Baji: Investigation of the photocatalytic activity of amorphous titanium-dioxide. *11th International Conference "Students for Students,* 22-26 April **2015,** Kolozsvár [Cluj], Romania
43. Tamás Firkala, Attila Farkas, Balázs Vajna, György Marosi, György Pokol, Imre Miklós Szilágyi: Felületerősített Raman térképezés alkalmazása a gyógyszeripari technológiában [Application of surface enhanced Raman imaging in pharmaceutical technology]. *BME-VBK Oláh György Doktori Iskola X. konferenciája [X Conference of the George Olah PhD School, Faculty of Chemical Technology and Biotechnology, Budapest University of Technology]*. 5 February **2015,** Budapest, Hungary
44. Imre Miklós Szilágyi: Atomiréteg-leválasztás a nanotechnológiában. [Atomic layer deposition in nanotechnology]. *A természettudományok időszerű kérdései és diskurzusai c. nemzetközi hatókörű tudományos tanácskozás, [Scientific meeting on the timely questions of natural sciences],* Magyar Tannyelvű Tanítóképző Kar, Szabadka, Forum Könyvkiadó Intézet – Létünk folyóirat, 25 October **2014,** Újvidék [Novi Sad], Serbia
45. Dávid Hunyadi, Imre Miklós Szilágyi: Az ammónium-paravolframát, $(NH_4)_{10}[H_2W_{12}O_{42}]\cdot 4H_2O$, ipari alapanyag alternatív előállításának kifejlesztése [Development of an anternative synthesis route for ammonium paratungstate for $(NH_4)_{10}[H_2W_{12}O_{42}]\cdot 4H_2O$, industrial starting material]. [*A természettudományok időszerű kérdései és diskurzusai c. nemzetközi hatókörű tudományos tanácskozás, [Scientific meeting on the timely questions of natural sciences]*, Magyar Tannyelvű Tanítóképző Kar, Szabadka, Forum Könyvkiadó Intézet – Létünk folyóirat, 25 October **2014,** Újvidék [Novi Sad], Serbia
46. Imre Miklós Szilágyi, Nóra Justh, Tamás Firkala, Krisztina László, Zsófia Baji, János Lábár: Preparation of fullerene (C_{60})-TiO_2 nanocomposites by atomic layer deposition (ALD). *11th European Symposium on Thermal Analysis and Calorimetry,* 17-21 August **2014,** Espoo, Finland
47. Imre Miklós Szilágyi, Fanni Fekete, László Kótai: Recycling the industrial waste $ZnFe_2O_4$ from hot-dip galvanization sludge. *11th European Symposium on Thermal Analysis and Calorimetry,* 17-21 August **2014,** Espoo, Finland
48. Dávid Hunyadi, István Sajó, Imre Miklós Szilágyi: Structure and thermal decomposition of ammonium metatungstate. *11th European Symposium on Thermal Analysis and Calorimetry,* 17-21 August **2014,** Espoo, Finland
49. Dávidné Nagy, Imre Miklós Szilágyi, Tamás Firkala, Xianfeng Fan: Study about the morphology effect on the photo-efficiency of WO_3. *6th International Conference on Applied Energy – ICAE2014,* 30 May-2 June, **2014,** Taipei, Taiwan
50. S. Boyadjiev, R. Yordanova, V. Georgieva, Z. Baji, I. M. Szilágyi: Preparation, characterization and study of the gas sensing properties of sputtered TiO_2 and ALD deposited ZnO and TiO_2 thin films. *International Conference on Oxide Materials for Electronic Engineering – fabrication, properties and application (OMEE-2014),* 26-30 May **2014,** Lviv, Ukraine
51. Imre Miklós Szilágyi, Nóra Justh, Krisztina László, Zsófia Baji, Tamás Firkala, János Lábár: A C60-fullerén funkcionalizálásának termoanalitikai vizsgálata. [Thermoanalytical study on the functionalization of C60 fullerene]. *Az MTA Analitikai és Környezetkémiai Tudományos Bizottságának és az MKE Analitikai Szakosztályának közös ülése. [Joint meeting of the Analytical and Environmental Chemistry Scientific Board of the Hungarian Academy of Sciences and of the Analytical Section of the Hungarian Chemical Society]*, 23 April **2014,** Budapest, Hungary
52. Gergő János Mikula, Zsófia Baji, Imre Miklós Szilágyi: Nucleation of metal oxides in Atomic Layer Deposition on modified silicon surfaces. *11th International Conference "Students for Students,* 9-13 April **2014,** Kolozsvár [Cluj], Romania
53. Imre Miklós Szilágyi: A WO_3 szerkezetének és összetételének hatása a fotokatalízisre és gázérzékelésre. [Influence of the structure and composition of WO_3 on photocatalysis and gas sensing]. *ELFT Vákuumfizikai, -technológiai és Alkalmazásai Szakcsoport, MTA Felületkémiai és Nanoszerkezeti Munkabizottság, Magyar Vákuumtársaság (HVS), MTA Elektronikus Eszközök és Technológiák Bizottság (EETB) közös szemináriuma, [Joint meeting of the Loránt Eötvös Physics Society, Hungarian Academy and Hungarian Vacuuum Society]*, 17 March **2014,** Budapest, Hungary
54. Dávidné Nagy, Imre Miklós Szilágyi, Xianfeng Fan: WO_3/TiO_2 nanowires for enhanced visible photocatalytic activity. *2nd UK Solar Fuels Symposium,* 14 January **2014,** Liverpool, UK

55. Dávid Hunyadi, Imre Miklós Szilágyi: Ammónium-volframátok szerkezete és termikus bomlása. [Structure and thermal decomposition of ammonium tungstates]. *MTA Termoanalitikai Munkabizottságának ülés, Meeting of the Thermoanalytical Workgroup of the Hungarian Academy of Sciences]*, 29 November **2013,** Budapest, Hungary
56. Csaba ifj. Várhelyi, György Pokol, László Korecz, Ágnes Gömöry, Imre Miklós Szilágyi, Firuţa Goga, Vladiszlav Izvekov: Új Cu-komplexek azometin-származékokkal [New Cu-complexes with Azomethine Derivatives]. *XIX. Nemzetközi Vegyészkonferencia, [XIX. International Chemistry Conference]* 21-24 November **2013,** Nagybánya (Baia Mare) Romania,
57. Csaba ifj. Várhelyi, Renáta-Ildikó Nagy, György Pokol, Imre Miklós Szilágyi, Ágnes Gömöry: Szulfittartalmú aszimmetrikus Co(III)-komplexek dioximokkal. [Sulfite containing assymetric Co(III) compleyes with dioximes]. *EME Természettudományos szakosztály ülés, [Meeting of the Natural Sciences Section of the Hungarian Scientific Society of Transylvania]*, 23 November **2013,** Kolozsvár, [Cluj], Romania
58. D. Hunyadi, I.M. Szilágyi: Az ammónium-paravolframát, $(NH_4)_{10}[H_2W_{12}O_{42}]\cdot 4H_2O$, ipari alapanyag alternatív előállításának kifejlesztése [Development of an anternative synthesis route for ammonium paratungstate for $(NH_4)_{10}[H_2W_{12}O_{42}]\cdot 4H_2O$, industrial starting material]. *XXXVI. Kémiai Előadói Napok [XXXIII Chemical Lecture Days]*, 28-30 October **2013**. Szeged, Hungary
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60. Imre Miklós Szilágyi, Tamás Firkala, Dávidné Nagy, Mikko Ritala, Markku Leskelä: Nanostructured photocatalysts prepared by atomic layer deposition. *ROMPHYSCHEM 15. International Conference of Physical Chemistry* 11-13 September **2013,** Bukarest, Romania
61. Laura Mättö, Imre Miklós Szilágyi, Timo Sajavaara: Coating and functionalization of high density ion track structures by atomic layer deposition. *11th European Conference on Accelerators in Applied Research and Technology,* 8-13 September **2013,** Namur, Belgium,

Conference presentations – posters

1. S. I. Boyadjiev, V. Georgieva, L. Vergov, I. M. Szilágyi: Gas sensing properties of ALD grown very thin TiO_2 and ZnO films. *20th International Summer School on Vacuum, Electron and Ion Technologies*, 25 − 29 September **2017,** Sozopol, Bulgaria
2. S. I. Boyadjiev, B. Manduca, O. Kéri, K. A. Gesheva, I. M. Szilágyi: ALD prepared transition metal oxides core-shell nanocomposites for photocatalytic, gas sensing and electrochromic applications. *Joint EuroCVD 21 – Baltic ALD 15 Conference, 11 – 14 June,* **2017,** Linköping, Sweden,
3. Nóra Justh, Krisztina László, Barbara Berke, Imre Miklós Szilágyi: Thermal analysis of the improved Hummers synthesis method of graphene oxide. *1st Journal of Thermal Analysis and Calorimetry and 6th V4 (Joint Czech–Hungarian–Polish–Slovakian) Thermoanalytical Conference (JTACC+V4),* 6–9 June, **2017,** Budapest, Hungary
4. Orsolya Kéri, Eszter Kocsis, Zsombor Kristóf Nagy, Tamás Igricz, Bence Parditka, Zoltán Erdélyi, Imre Miklós Szilágyi: Preparation and analysis of metal-oxide nanotubes. *1st Journal of Thermal Analysis and Calorimetry and 6th V4 (Joint Czech–Hungarian–Polish–Slovakian) Thermoanalytical Conference (JTACC+V4),* 6–9 June, **2017,** Budapest, Hungary
5. Teodóra Nagyné Kovács, Dávid Hunyadi, Alex Leandro Andrade de Lucena, Imre Miklós Szilágyi, György Pokol: Thermal decomposition of ammonium molybdates. *1st Journal of Thermal Analysis and Calorimetry and 6th V4 (Joint Czech–Hungarian–Polish–Slovakian) Thermoanalytical Conference (JTACC+V4),* 6–9 June, **2017,** Budapest, Hungary
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8. Nagyné Kovács Teodóra, Pokol György, Lukács István, Szilágyi Imre Miklós: Vas-volframát ($FeWO_4$) nanolemezek előállítása hidrotermális eljárással. [Preparation of iron tungstate ($FeWO_4$) nanoplates by

hydrothermal method.] *BME-VBK Oláh György Doktori Iskola XIV. konferenciája [XIV Conference of the George Olah PhD School, Faculty of Chemical Technology and Biotechnology, Budapest University of Technology]*. 02 February **2017,** Budapest, Hungary

9. Justh Nóra, Mikula Gergő János, László Krisztina, Nagy Balázs, Erdélyi Zoltán, Parditka Bence, Igricz Tamás, Szilágyi Imre Miklós: Aerogél / TiO_2 kompozitok létrehozása atomi rétegleválasztással. [Preparation of aerogel / TiO_2 composites by atomic layer deposition.] *BME-VBK Oláh György Doktori Iskola XIV. konferenciája [XIV Conference of the George Olah PhD School, Faculty of Chemical Technology and Biotechnology, Budapest University of Technology]*. 02 February **2017,** Budapest, Hungary
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11. Amit Zodge, Márton Kőrösi, Dávid Hunyadi, Ildikó Kmecz, János Madarász, Imre Miklós Szilágyi, Tamás Sohajda, Edit Székely: Enantioselective diastereomeric salt formation of 4-chloromandelic acid with (R)-(+)-α-Phenylethylamine and in supercritical CO_2. *15th European meeting on Supercritical Fluids,* 8-11 May **2016,** Essen, Germany
12. László Lőrincz, György Bánsághi, Máté Zsemberi, Sandra De Simón Brezmes, Imre Miklós Szilágyi, János Madarász, Tamás Sohajda, Edit Székely: Diastereomeric salt precipitation based resolution of ibuprofen by gas antisolvent method. *BME-VBK Oláh György Doktori Iskola XIII. konferenciája [XIII Conference of the George Olah PhD School, Faculty of Chemical Technology and Biotechnology, Budapest University of Technology]*. 11 February **2016,** Budapest, Hungary
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18. Dávid Hunyadi, I.M. Szilágyi, L. A. Tóth, E.Drotár, T. Igricz: Ammónium-paravolframát, $(NH_4)_{10}[H_2W_{12}O_{42}]\cdot 4H_2O$ ipari alapanyag előállítása szilárd-gáz fázisú reakcióval [Preparation of ammonium paratungstate, $(NH_4)_{10}[H_2W_{12}O_{42}]\cdot$industrial starting material by solid-gas pase heterogenous synthesis]. *BME-VBK Oláh György Doktori Iskola X. konferenciája [X Conference of the George Olah PhD School, Faculty of Chemical Technology and Biotechnology, Budapest University of Technology]*. 5 February **2015,** Budapest, Hungary
19. S. Boyadjiev, V. Georgieva, Z. Baji, I. M. Szilágyi: Preparation and characterization of ALD deposited ZnO and TiO_2 thin films studied for gas sensors. *Science and Applications of Thin Films, Conference & Exhibition (SATF 2014),* 15-19 September **2014,** Izmir, Turkey
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23. R. Calavia, S. Roso, R. Vázquez, I. M. Szilagyi, E. Llobet: Gas sensing properties of nanostructured ZnO films obtained by atomic layer deposition on porous anodic alumina templates. *European Materials Research Society Spring Meeting, 26-30 May* **2014,** Lille, France
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