Sprawozdanie z udziału

w

Konferencji
Advanced Functional Materials for Optics, Lasers and Photovoltaics Applications
I
Wystawie Fotowoltaiki

Kenitara
14-16 Czerwca 2022

Prof. dr hab. inż. Zbigniew Kąkol
Akademia Górniczo-Hutnicza im. St. Staszica
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W ramach ministerialnego projektu "Nauka dla Społeczeństwa" realizowanego w Akademii Górniczo-Hutniczej odbył się wyjazd na Konferencje Advanced Functional Materials for Optics, Lasers and Photovoltaics Applications i wystawe fotowoltaiki w Kenitrze (Marocco) w dniach 14 do 16 czerwca 2022.

Home

Welcome to the International Conference

Advanced Functional Materials for Optics, Lasers and Photovoltaics Applications

June 14, 15 & 16, 2022

Kenitra, Morocco

AFMOLPhA'2022 PROGRAM

Organized by

Superior School of Technology & Faculty of Sciences
Materials Physics and Subatomic laboratory
Ibn-Tofaïl University
Kenitra-Morocco

Faculty of Sciences
MOLTECH Anjou Institute UMR CNRS 6200
Angers University
Angers-France

AFMOLPhA'2022 PROGRAM

Tuesday 14-06		
8h30 – 12h00	**Registration**	
9h00 – 9h30	**Opening Ceremony** **Prof. Azzeddine EL MIDAOUI**, President of Ibn Tofail University, Kenitra, **Morocco** **Prof. Hassane ERGUIG**, Director of the Superior School of Technology, Ibn-Tofail University, Kenitra, **Morocco** **Prof. Mohammed EBN TOUHAMI**, Dean of the Faculty of Sciences, Ibn Tofail University, Kenitra, **Morocco** **His Excellency Krzysztof KARWOWSKI**, Ambassador of **Poland** in **Morocco**	
9h30 – 10h00	Chairs: Prof. Bouchta SAHRAOUI, Dr. Tarek CHTOUKI, Prof. Khalid NOUNEH	
	9h30. Tuesday — Plenary Speaker Organic widely real-time tunable lasing Prof. Jaroslaw MYSLIWIEC (Wroclaw University of Science and Technology, **Poland**)	
10h00 – 10h30	Coffee Break	
10h30 – 11h00	10h30. Tuesday — Plenary Speaker Optical effects in thin films of hybrid organic-inorganic halide perovskites Prof. Anna ZAWADZKA (Nicolaus Copernicus University, **Poland**)	
11h00– 12h20	Tuesday — Invited Speakers	
	11h00-11h20: **Prof. Aurelian Catalin GALCA,** P-type emerging materials for photovoltaics: facts and artifacts in optical and structural characterization (**Romania**)	
	11h20-11h40: **Prof.Konstanty MARSZALEK,** Cr+ implanted copper oxide absorber thin films for photovoltaics (**Poland**)	
	11h40-12h00: **Dr. Serap YIĞIT GEZGIN,** Modelling of plasmonic CZTS/Si heterojunction solar cell (**Turkey**)	
	12h00-12h20: **Dr. Karim BOUCHOUIT,** DFT analysis and third-harmonic generation properties of one series of electronic push-pull organics compounds (**Algeria**)	
12h20 – 14h00	Lunch	
	Chairs: Prof. Jaroslaw MYSLIWIEC & Prof. Mohamed EL HASNAOUI	
14h00 – 15h40	Tuesday — Invited Speakers	
	14h-14h20: **Prof. Liu LIWEI**, Label-free Multimodal Microscopic Imaging Technology (**China**)	
	14h20-14h40: **Dr. Annamaria PANNIELLO**, Fluorescent Carbon Dots: Emerging Materials towards Optoelectronic Applications (**Italy**)	
	14h40-15h00: **Prof. Khalid NOUNEH**, Environmental friendly thin films and nanoparticles deposited by soft chemistry synthesis for energy and environment (**Morocco**)	
	15h00-15h20: **Prof. Jacek ZAKRZEWSKI**, Photothermal Determination of the Surface Treatment of II-VI Mixed Crystals (**Poland**)	
	15h20-15h40: **Prof. Mohssin ZEKRITI,** Waveguide-Coupled Long-Range Surface Plasmon Optical Sensors for Accurate Diagnosis of Breast Cancer (**Morocco**)	
15h40 – 16h10	Coffee Break & Poster Session	
16h10 – 17h50	Oral presentations	
	Session 1: Photovoltaics Chairs: Prof. Khalid NOUNEH & Prof. Anna ZAWADZKA	Session 2: Nonlinear optics & Laser Chairs: Dr. Tarek CHTOUKI & Prof. Konstanty MARSZALEK
	16h10-16h20: **Dr. I. Chabri.** $CsSnI_3$-based perovskite solar cell: Numerical analysis of inverted- structure with 24.18% efficiency (**Morocco**)	16h10-16h20: **Prof. Z. Ramzi.** Synthesis, thermal and optical properties of amorphous phases in Bi_2O_3–SrO–P_2O_5 system (**Morocco**)
	16h20-16h30: **Mr. J. Mhalla.** Contribution of magnons created in volume and within the surface in low-dimensional dilute magnetic semiconductor: eTBA Calculation for $Sn_{1-x}Co_xO_2$ (**Morocco**)	16h20-16h30: **Prof. K. Bahedi.** Morphology Effect on Linear Optical and Nonlinear Optical Properties predicted by Spectroscopic Study of Sprayed ZnO: W Thin Films (**Morocco**)
	16h30-16h40: **Mr. A.I. N'Guessan.** Copper Indium Sulfur (CIS) and quaternary chalcopyrite Copper Indium Gallium Sulfur (CIGS) deposited by the spray pyrolysis technique (**Spain**)	16h30-16h40: **Mrs. I. El Fengouchi**. Study of structural and optical properties of a novel pentafunctional epoxy resin reinforced with graphite and multiwalled carbon nanotube (**Morocco**)
	16h40-16h50: **Dr. A. Soussi**. Both optical and electronic characteristics of anatase TiO_2 thin films: A DFT and sol-gel studies (**Morocco**)	16h40-16h50: **Mrs. S. Chib.** Diffraction of doughnut beams by a helical axicon (**Morocco**)
	16h50-17h00: **Mrs. R. El Amri.** Growth and Characterization of α $Fe2O_3$ thin films prepared by RF magnetron sputtering (**Morocco**)	16h50-17h00: **Dr. K. Lakaal.** Rashba Spin-Orbit Interaction and Size Effects on the Nonlinear Optical Properties of $Si_{0.7}Ge_{0.3}$/Si Quantum Dots (**Morocco**)
	17h00-17h10: **Mr. B. Lamuadi.** Estimation of Solder Layer Degradation of an Insulated Gate Bipolar Transistor Power Module (Morocco)	17h00-17h10: **Dr. M. Lougdali.** Absorbance and Photoluminescence properties of Niq2 Thin film for OLED application (**Morocco**)
	17h20-17h30: **Dr. N. Mhiri.** Integration of New Analog Maximum Power Point Tracking Circuit of Photovoltaic Panels (**Tunisia**)	17h10-17h20: **Dr. A. Farchakh.** Analytical study of the magnetic behavior of a triangular single-walled nanotube with mixed spins (½, 1) (**Morocco**)
	17h10-17h20: **Mr. H. Najih.** Effect of the Bromine doping on the structural and optical properties of CH3NH3PbI3 Perovskite thin films via spin coating deposition (**Morocco**)	17h20-17h30: **Dr. A. Ait Hssi:** Synthesis and characterization of heterostructures: p-Cu_2O/n-ZnO-NRs/FTO by two-step electrochemical deposition technique (**Morocco**)
	17h30-17h40: **Mrs. R. Anoua:** Experimental and theoretical (DFT method) investigations of the natural dye extracted from Curcuma for dye-sensitized solar cells application (**Poland**)	17h30-17h40: **Mr. K. Fathi.** Design, Modeling, and Realization of New Efficient SILAR Equipment (**Morocco**)
	17h40-17h50: **Mr. Y. Charif-Alaoui.** Magnetic and magnetocaloric properties in metallic antiperovskite compound Mn_3InC (**Morocco**)	17h40-17h50: **Dr. R. Atir**. Carbazole-Based Hole-Transport Materials for Efficient Perovskite Solar Cells. A Computational Study- come back HTMs, thanks to improving solubility (Morocco)

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Wednesday 15-06		
	Chairs: Prof. Hamdi ŞÜKÜR KILIÇ & Prof. Aurelian Catalin GALCA	
9h00 – 10h00	Plenary Speakers	
	9h00. Wednesday — Some selected advanced functional materials for nonlinear optics and nanophothonics applications **Prof. Bouchta SAHRAOUI (University of Angers, France)**	
	9h30. Wednesday — Thiophene based molecular materials for nonlinear optics **Dr. Abdelkrim EL-GHAYOURY (University of Angers, France)**	
10h00 – 11h35	Wednesday — Invited Speakers	
	10h00–10h20: Dr. Tarek CHTOUKI, Influence of the Excitation Wavelength on Tunability of Random and Distributed Feedback Lasing (**Morocco**)	
	10h20–10h40: Dr. Dominique GUICHAOUA, Phase-Matched Magnetization-Induced Second-Harmonic Generation in Epitaxial Iron Garnet Thin Films (**France**)	
	10h40–11h00: Dr. Ikhwan Syafiq MOHD NOOR, Preparation and characterization of gel polymer electrolyte for perovskite solar cell (**Malaysia**)	
	11h00–11h20 Dr. Karol STRZAŁKOWSKI, Photopyroelectric calorimetry in thermal characterization of solids samples, theoretical and practical aspects (**Poland**)	
11h20 – 11h50	Coffee Break	
11h50 – 13h00	Oral presentations	
	Session 1: Photovoltaics Chairs: Dr. Yesemin GÜNDOĞDU & Prof. Khalid NOUNEH	Session 2: Nonlinear optics & Laser Chairs: Prof. Mohssin ZEKRITI & Dr. Tarek CHTOUKI
	11h50-12h00: **Dr. Y. Salhi.** Elaboration of CZTS films via CZT precursor layer electrodeposition followed by Mist-CVD sulfurisation (**Morocco**)	11h50-12h00: Mrs. **N. El Biyari.** 3D Printing of Optical Micro-Lenses via Stereolithography for Laser Beam Collimating and Focusing (**Morocco**)
	12h00-12h10: **Prof. A. Rmili.** Synthesis and characterization of Fe-doped CdS thin layers deposited via the sol gel method by spin coating for solar cells applications (**Morocco**)	12h00-12h10: **Mr. A. Jouamaa.** Composites based on PMMA and spherical or rod-shaped TiO_2 nanocrystals: optical and structural investigation (**Morocco**)
	12h10-12h20: **Mr. M. Boutamart**. Self-cleaning glass based on superhydrophobic coating for photovoltaic application (**Morocco**)	12h10-12h20: **Mr. A. Ahmidi.** Angular spectrum decomposition method for evaluating the beam shape coefficients of the pseudo-nondiffracting beams: A comparison with the localized approximation method (**Morocco**)
	12h20-12h30: **Dr. J. El Hamdaoui.** Ab initio study of structural, electronic and optical properties of $GeSnS_2$ (**Morocco**)	12h20-12h30: **Dr. S. Bayoud.** Enhanced visible emission of Lithium doped ZnO Thin Films Prepared by Spray Pyrolysis (**Morocco**)
	12h30-12h40: **Mr. L. Moulaoui.** Numerical simulation of $FaPbI_3$ perovskite based solar cells with graphene oxide as hole transport layer using SCAPS-1D (**Morocco**)	12h30-12h40: **Dr. E. El Halba.** Focus shaping of cylindrically polarized generalized Spiraling Beams by a linear axicon (**Morocco**)
	12h40-12h50: **Mrs. I. Driouch.** Precipitation synthesis of Zn doped $MnWO_4$ for energy storage application (**Morocco**)	12h40-12h50: **Dr. A. Tarbi.** Optimization of the absorption of the III-V distorted quaternary (**Morocco**)
13h00 – 14h00	Lunch	
	Chairs: Dr. Karol STRZAŁKOWSKI & Dr. Abdelkrim EL-GHAYOURY	
14h00 – 16h00	Invited Speakers	
	14h-14h20: **Dr. Said TABOUKHAT**, Control of NLO properties of selected Organometallic Complexes due to functionalization by different transition metals (**France**)	
	14h20-14h40: **Prof. Mohamed EL HASNAOUI,** Improvement of dielectric properties and thermal characterizations of innovative composite: Experimental and modeling (**Morocco**)	
	14h40-15h00: **Prof. George A. STANCIU,** Superresolution imaging by using far field and near field label free microscopy techniques,**Romania**	
	15h00-15h20: **Dr. Przemysław PŁÓCIENNIK,** Examples of the construction of solar cells and techniques for measuring their basic parameters (**Poland**)	
	15h20-15h40: **Dr. Sidiki ZONGO,** State of nanotechnology research in sub-Saharan countries: opportunities and challenges (**Burkina Faso**)	
15h40 – 16h30	Coffee Break & Poster Session	
16h40 – 17h40	Oral presentations	
	Session 1: Photovoltaics Chairs : Prof. Khalid NOUNEH & Dr. Serap YIĞIT GEZGIN	Session 2: Nonlinear optics & Laser Chairs : Dr. Tarek CHTOUKI & Dr. Dominique GUICHAOUA
	16h40–16h50: **Mr. A. Ouhammou.** Indirect-to-Direct Band Gap Transition of $Cs_2Na_{1-x}In_xBiF_6$ for photovoltaic application (**Morocco**)	16h40–16h50: **Mr. B. El Mechate**. Generation of parabolic-like beams (**Morocco**)
	16h50–17h00: **Mrs. S. Lidaighbi.** A new hybrid method to estimate the single-diode model parameters of solar photovoltaic panel (**Morocco**)	16h50–17h00: **Dr. K. Bria.** Angular distribution of sputtered Inconel 718 alloys: Simulation Study (**Morocco**)
	17h00–17h10: **Dr. L. Boulkaddat.** Elaboration and characterization of Cu_2ZnSnS_4 thin films for low-cost solar cells (**Morocco**)	17h00–17h10: **Prof. M. Zekriti.** Waveguide-Coupled Long-Range Surface Plasmon Optical Sensors for Accurate Diagnosis of Breast Cancer (**Morocco**)
	17h10-17h20: **Mr. K. Kone.** Surface engineering of Zinc Oxide thin as an electron transport layer for perovskite solar cells (**Spain**)	17h10-17h20: **Dr. M. Soumane.** Design and Characterization of One-Dimensional SnO_2 using Forcespinning technique for optoelectronic application (**Morocco**)
	17h20-17h30: **Msc. M. Bounbaa.** First principales study of molybdenum dichalcogenides monolayers for lithium-ion batteries applications (**Morocco**)	17h20-17h30: **Dr. V. Ovdenko.** The substituent effect on laser beam self-action and elastic light scattering manifestation in thin films of azo-azomethine PMMA composites (**Ukraine**)
	17h30-17h40: **Dr. M. Bouachri.** Effect of cycle numbers on optical properties of nanostructured Bi_2S_3 thin films deposited using SILAR Method for Solar Cells light harvesting (**Morocco**)	17h30-17h40: **Dr. P. Forouzandeh.** MXenes based nanocomposites for supercapacitor-based energy storage devices (**Ireland**)
20h00 – 22h00	**Gala Dinner**	

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Thursday 16-06		
	Chairs: Prof. Mohamed EL HASNAOUI & Prof. Youssef EL KOUARI	
9h00 – 10h00	Plenary Speakers	
	9h00. Production and Optical Characterization of Indium gallium zinc oxide (IGZO) Thin Film with Pulsed Laser Deposition (PLD) Method Prof. Hamdi Şükür KILIÇ (University of Selçuk, Konya, Turkey)	
	9h30. Laser Induced Breakdown Spectroscopy (LIBS) for Food Quality and Authenticity Applications Prof. Stelios COURIS (Institute of Chemical Engineering Sciences (ICE-HT), FORTH-Hellas, Patras, Greece)	
10h00 – 10h15	Coffee Break	
	Chairs: Prof. Anna ZAWADZKA & Dr. Przemysław PŁÓCENNIK	
10h15– 12h00	Invited Speakers	
	10h15– 10h35: **Dr. Sahaya DENNISH BABU,** Metal Halide Perovskite Nanomaterials for Advanced Optoelectronic Applications (**India**)	
	10h35–10h55: **Dr. Yesemin GÜNDOĞDU,** Investigation and Interpretation of Nonlinear Optical Properties of Cu_2SnS_3 (CTS) Thin films Synthesized by Using Pulsed Laser Deposition Technique (**Turkey**)	
	10h55–11h15: **Dr. Mohammed MAKHA,** Thin Film Solar Cell Technologies: Exploring New Materials and Manufacturing Processes to Improve Performance (**Morocco**)	
	11h15–11h35: **Dr. Amal BOUICH,** Opportunities and Challenges of Halide Perovskites for high efficiency and stable solar cells (**Spain**)	
	11h35– 11h55: **Prof. Abdelhafed TALEB,** Optical properties of metallic nanoparticles and their potential to improve solar energy conversion (**France**)	
12h00 – 13h20	Oral Lectures	
	Session 1: Photovoltaics Chairs: Dr. Amal BOUICH & Dr. Mohammed MAKHA	Session 2: Nonlinear optics & Laser Chairs: Dr. Tarek CHTOUKI & Dr. Said TABOUKHAT
	12h00–12h10: **Mr. A. Idrissi.** Designing new thiophene-based hole transporting materials for perovskite solar cells (**Morocco**)	12h00–12h10: **Dr. M. Bensada**. Numerical modelling of Nd-YAG laser melting process of $X_{30}Cr_{13}$ stainless steel (**Morocco**)
	12h10–12h20: **Mr. Z. El Fakir.** The effect of the π-bridge in Carbazole-based HTMs for Perovskite Solar Cells (**Morocco**)	12h10–12h20: **Mr. P.S.B. Macheso.** Reviewing the Role of Fiber Bragg Grating Temperature Sensors in Smart Factories (**Morocco**)
	12h20–12h30: **Mr. S. Drissi.** Synthesis and characterization of the new $Cu_2Fe_{1-x}Co_xSnS_4$ thin films for solar cells (**Morocco**)	12h20–12h33: **Dr. Douhi.** Improvement of ultra-wideband (UWB) All-Textile Antenna performance using Metamaterial for radiofrequency (RF) energy harvesting: SAR reduction and gain enhancement (**Morocco**)
	12h30–12h40: **Mrs. A. Dloo.** Effect of buffer layer thickness on the growth of ZnO nanowires array toward photovoltaic application (**Morocco**)	12h30–12h40: **Dr. M.Y. Zaki.** Sequential magnetron sputtering approach for the synthesis of Cu_2ZnSnS_4 films (**Morocco**)
	12h40-12h50: **Mr. Y. Doumbia.** Boosting the stability and growth of Methylammonium Lead Bromide through FA dopant for solar cells (**Spain**)	12h40-12h50: **Dr. M. Tair.** Hydrogen storage technology (**Morocco**)
	12h50-13h00: **Mr. A. El Rharib.** The study of electronic and optical properties of double perovskite $Rb_2AgBiBr_6$ using first-principle (**Morocco**)	12h50-13h00: **Dr. S. Dahbi.** Chalcogens' impurities and a single F-center in SHO: Ab initio calculations (**Morocco**)
	13h00-13h10: **Mr. O. Jhabli.** Modified lead current collector by electrochemical graphene oxide reduction for lead-carbon battery (**Morocco**)	13h00-13h10: **Dr. M. Boumzough.** Structural, Electronic, Optical and Thermoelectric Properties of Molybdenum Dichalcogenides Monolayers MoX_2 (X=S,Se,Te) for optoelectronic application (**Morocco**)
	13h10-13h20: **Dr. H. Saadi.** Elaboration of zinc oxide (ZnO) nanopowders for a photovoltaic application (**Morocco**)	
13h20 – 13h50	Closing Ceremony	
13h50 – 14h50	Lunch	
	Excursion	

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POSTER SESSION 1_TUESDAY 14 JUNE 2022	POSTER SESSION 2_WEDNESDAY 15 JUNE 2022
From P-1 to P-20	From P-21 to P-41

P1_H. Nabil, A. Balhamri, A. Belafhal. *Evolution properties of Some Laser Beams propagating in Jet Engine Exhaust.*

P2_ H. Nassiri, I. Driouch, M.Y. Messous, R. El Bouayadi. *Precipitation synthesis of Cr doped TiO_2 for dye-sensitized solar cell application*

P3_ Y. Benhouria, M. Kibbou, A. Oubelkacem, I. Essaoudi, A. Ainane. *Anti-perovskite Mn_3PdN: Potential candidates for an application in magnetic refrigeration*

P4_O. Aitmellal, L. Oufni, M.Y. Messous, M.M. Trandafir, S. Neatu, M. Florea, M. Secu, F. Neatu. *Structural, optical, and photoluminescence investigations of CeO_2:Mn_3O_4 :(0.5%Tb_2O_3-3.5%La_2O_3-Al_2O_3) phosphor for solar cell application*

P5_Abdellatif El-Habib, Abdesamad Aouni, Mustapha Diani, Khalid Nouneh, Jamal Zimou, Mohammed Addou. *Investigation of physical and electrochemical properties of Gd doped CeO_2 nanocrystalline thin films*

P6_I. EL Ouedghiri-Idrissi, A. Zawadzka, Z. Sofiani. *Investigations of photophysical properties of organic material 2,3-Triphenyl-1H-Imidazole*

P7_ M.Y. Messous, I. Driouch, O. Aitmellal, H. Nassiri, Z. Sadoune. *Influence of Ytterbium-doping on the Structural properties of $LaMnO_3$ perovskite oxide nanoparticles*

P8_Zakaria Barbouch, Nadia Elharfaoui, Jamal Zimou, Abdellatif El-Habib, Mustapha Beraich, Khalid Nouneh, Mounir Fahoume. *Synthesis, structural and optical characteristics of Zn-doped Co_3O_4 layers deposited by spray pyrolysis*

P9_M. Beraich. *Experimental and DFT study of new kesterite Cu_2NiGeS_4 thin film synthesized via spray ultrasonic technic*

P10_K. Fri, A. Laazizi, M. El Jai, I. Akhrif, M. Bensada. *The influence of laser power and speed on SLM additive manufacturing*

P11_ Ilyass Jellal, Othmane Daoudi, Khalid Nouneh, Mounir Fahoume, Jamal Naja. *Low-temperature growth of highly crystalline ZnO thin films by mist chemical vapor deposition technique*

P12_M. A. Hachimi, T. Chtouki, H. Erguig. *Review of structural, morphological, linear, and nonlinear opti-cal properties of SnO_2 thin films deposited by spray pyrolysis technique*

P13_L. Nkhaili, A. El Kissani, A. Narjis, M. Bousata, A. Outzourhit, S. Elmassi, H. Amiri, K. El Assali. *Growth and mechanism of CTS films by RF-sputtering*

P14_A. Laouid, A. Alaoui Belghiti, K. Wisniewski, A. Hajjaji, *Przemysław Płóciennik, Janusz Strzelecki, Anna Zawadzka Structural and optical properties of ZnS thin films prepared by the physical vapor deposition.*

P15_A. Abouais, A. Alaoui Belghiti, K. Strzalkowski, A. Hajjaji. *Photopyroelectric PPE Method*

P16_Z. El-Ansary, E. Petronijevic, A. Belardini, T. Cesca, C. Scian, G. Mattei, C. Sibilia, M. El Hasnaoui. *Experimental characterization of chiro-optical properties and origin of circular dichroism in 2D Arrays of Nanoholes in Silver*

P17_A. El Haimeur, M. El Ghayyaty, P. Fernández Sánchez, K. Nouneh, H. Bakkali, E. Blanco, M. Dominguez. *Optoelectronic properties of TiO_2/ZnO and TiO_2/Ni-doped ZnO thin films*

P18_M. Karam, A. Fahmi, A. Qachaou. *Effect on the magnetic properties created in a thin film superlattice based on a $Ge_{1-x}Fe_x$/Ge magnetic semiconductor*

P19_S. Khalid, N. Dkhireche, M. Galai, R. Belakhmima. *Study of the effect of some derivatives of Quinoline Hydrochloride on the corrosion of brass in 3% NaCl medium*

P20_Y. Selmani, H. Labrim, D. Zejli, R. El bouaydi, L. Bahmad. *Band-gap engineering in $CaZrO_{3-x}S_x$ (x=0, 1, 2 and 3) simple perovskites for photovoltaic applications*

P21_B. Daoudi, K. Nouneh, A. talbi, I. el bakkali, A. Rmili, O. drissi, S. Mtougui. *Synthesis and characterization of CuS thin film deposited by SILAR*

P22_M. El-Mrabet, T. Chtouki, A. El Halouani, H. Erguig. *A critical review on the power conversion efficiency (PCE) of solar cells perovskite prepared by cation based methylammonium (MA), formamidinium (FA) and mixture of methylammonium/formamidinium (MA/FA).*

P23_S. Benkhirat, K. Nouneh, G. Plantard. *Development of macroporous geopolymer foams functionalized by a photocatalyst.*

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P24_Safia Dassallem, Nouneh Khalid, Abdelhafed Taleb. *Design and realization of electrodes modified by hierarchical nanostructures for the detection of environmental pollutants*

P25_A. Lemnawar, K. Nouneh, H. Labrim, R. El Bouayadi, S. Ziti, Y. Benhouria, N. El Harfaoui, A. Talbi. *Magneto-optic properties of the perovskite* $SmFeO_3$

P26_M. Lougdali, Y. El kouari, R. Anoua, M. Zazoui, A. Zawadzka, Y. Abboud, P. Płóciennik, K. Waszkowska, B. Sahraoui. *Linear and Non Linear Optical properties of Niq2 Thin film*

P27_R. Anoua, S. Touhtouh, M. El Jouad, A. Hajjaji, M. Bakasse, B. Sahraoui, P. Płóciennik, Anna Zawadzka. Absorbance, photoluminescence and electronic properties of Curcuma for dye-sensitized solar cells

P28_O. Drissi, K. Nouneh, N. El Harfaoui, R. Hsissou, B. Daoudi, M. Azogagh. *Green synthesis of silver nanoparticles using aqueous pulp extract of Argania spinosa (L). Skeels*

P29_A. Abouais, A. Alaoui Belghiti, K. Strzalkowski, A. Hajjaji. *Crystal growth of semiconductor materials*

P30_M. Oubakalla, M. Taibi, A. Zarrouk, M. Fahoume. *The impact of copper concentration on the* Cu_2CoSnS_4 *thin films properties co-electrodeposited on the FTO substrate*

P31_O. Daoudi, I. Jellal, M. Lharch, K. Nouneh, M. Fahoume. *Comparative Study of Zn, Ni and Al doped CuO thin films deposited by SILAR method: Structural, morphological and optical properties*

P32_S. Derbali, N. Bouri, M. Florea, L. N. Leonat, V. Stancu, A. Tomulescu, A. C. Galca, M. Secu, L. Pintilie, M. Ebn Touhami, K. Nouneh. *Potassium-containing triple-cation perovskite solar cells*

P33_J. Zimou, Y. Khaaissa, K. Nouneh, L. El Gana, Z. Barbouch, A. El-Habib, M. Addou. *Experimental and numerical study of* $Ce1\text{-}xFexO_2$ *thin films for photovoltaic applications*

P34_M. Hanine, J. Hemine, A. Daoudi. *Dielectric spectroscopy of polymer stabilized ferroelectric liquid crystal*

P35_M. El-Mrabet, T. Chtouki and H. Erguig. *Review of third-order nonlinear optical response in pure and doped nickel oxide materials (NiO): experimental and theoretical aspects*

P36_I. El Housni, S. Mtougui, N. El Mekkaoui, R. Khalladi, S. Idrissi, S. Ziti, H. Labrim, L. Bahmad. *Magnetic properties of the nano brownmillerite* $KBiFe_2O_5$*: Monte Carlo simulations*

P37_R. El Otmani, A. El Manouni, A. Almaggoussi. *Numerical Simulation of CZTSe Based Solar Cells Using Different Back Surface Field Layers: Improvement and Comparison*

P38_F. Mansouri, A. Talbi, Y. Khaaissa, K. Nouneh. *Effect of Al doping rate on physical properties of ZnS thin films prepared by Mist CVD technique*

P39_L. Znaidi, K. Nouneh, M. Fahoume. *Characterization and photocatalytic properties of CuO thin films prepared by successive ionic layer adsorption and reaction method (SILAR)*

P40_F. Khalid, B. Faiçal, F. Mounir. *Elaboration and characterization of thin layers of* $MgAl_2O_4$ *prepared by electrodeposition at fixed applied potential.*

P41_ S. Abed, H. Djaaboube, K. Waszkowska, K. Bouchouit, R. Aouati, A. Bouabellou. *The effect of Zn doping on the optical and nonlinear optical properties of MgO thin films deposited by dip coating technique*

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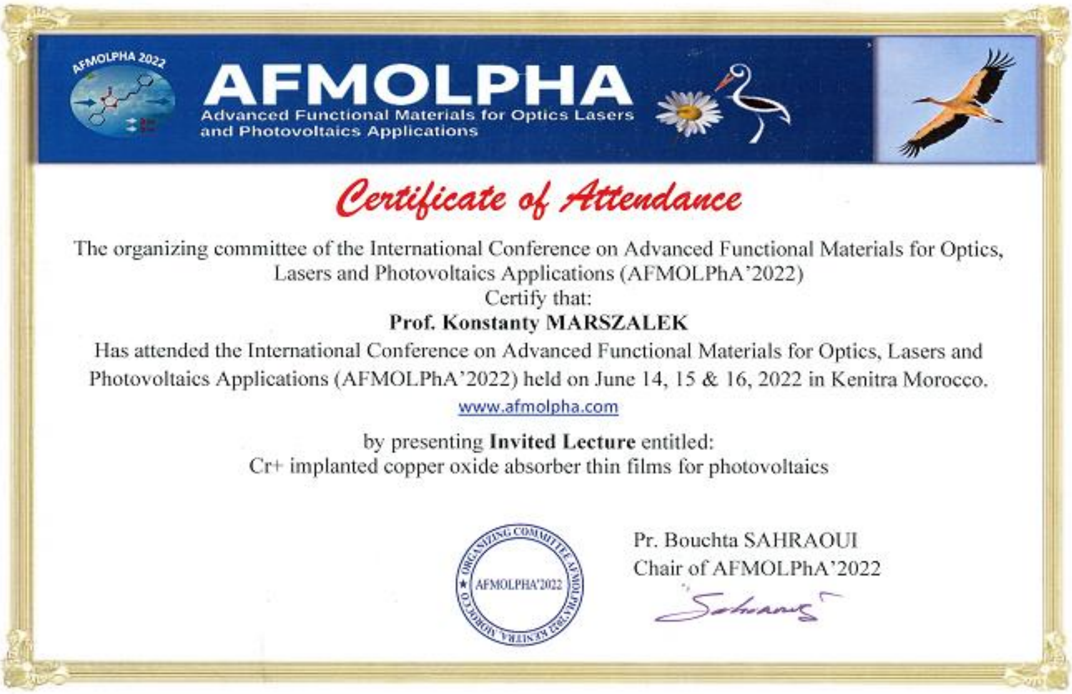

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Advanced Functional Materials for Optics Lasers and Photovoltaics Applications

Certificate of Attendance

The organizing committee of the International Conference on Advanced Functional Materials for Optics, Lasers and Photovoltaics Applications (AFMOLPhA'2022)
Certify that:
Prof. Konstanty MARSZALEK
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by presenting **Invited Lecture** entitled:
Cr+ implanted copper oxide absorber thin films for photovoltaics

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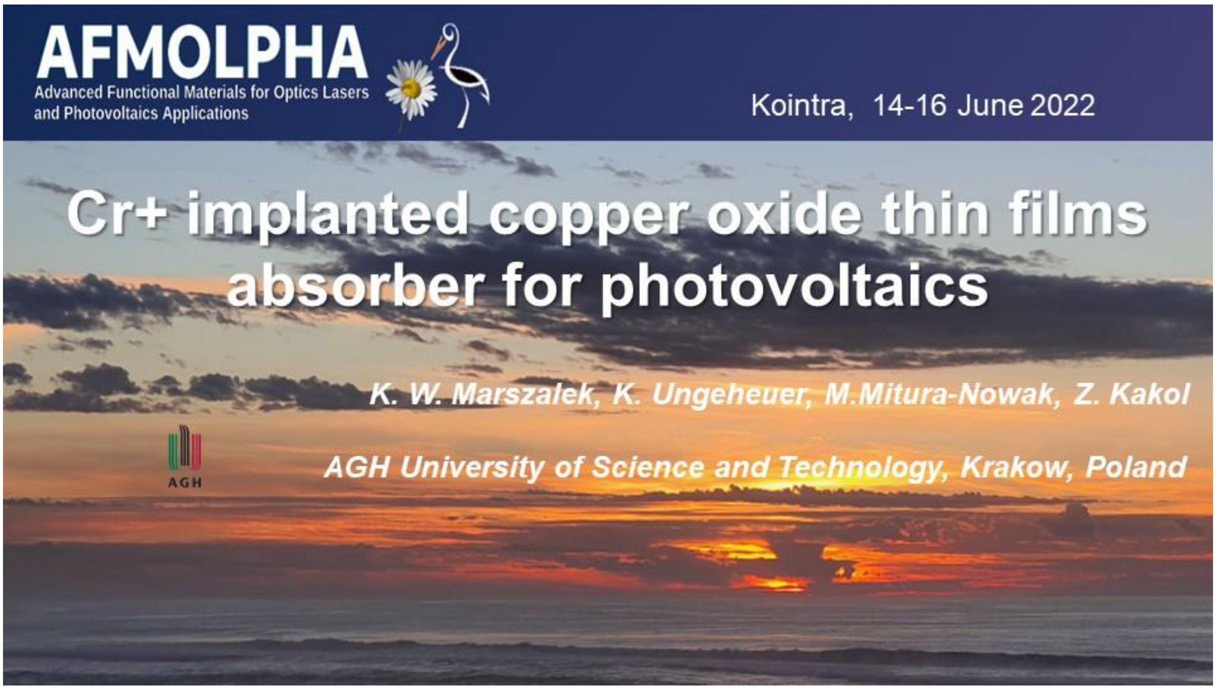

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Motivation

- European Project- Universeh - „Space University”
- Thin film Photovoltaics on elastic substrates
- Investigation in Space standarts (temperatures and irradiation)
- Step by step deposition of all PV cel components

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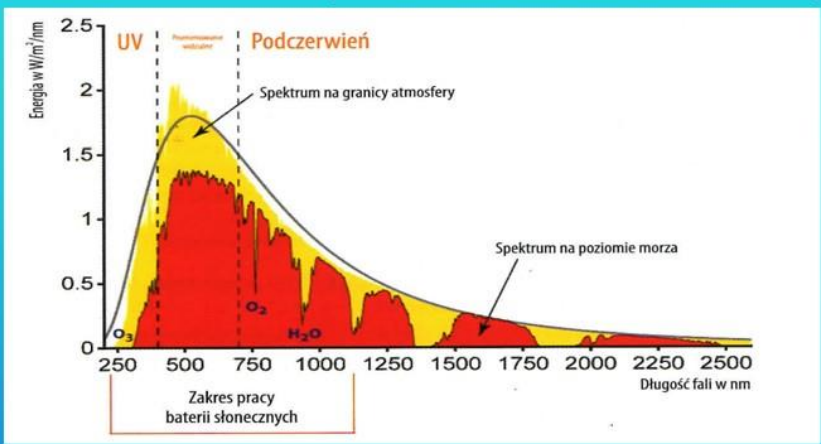

Working range of solar cell compared to solar radiation spectrum

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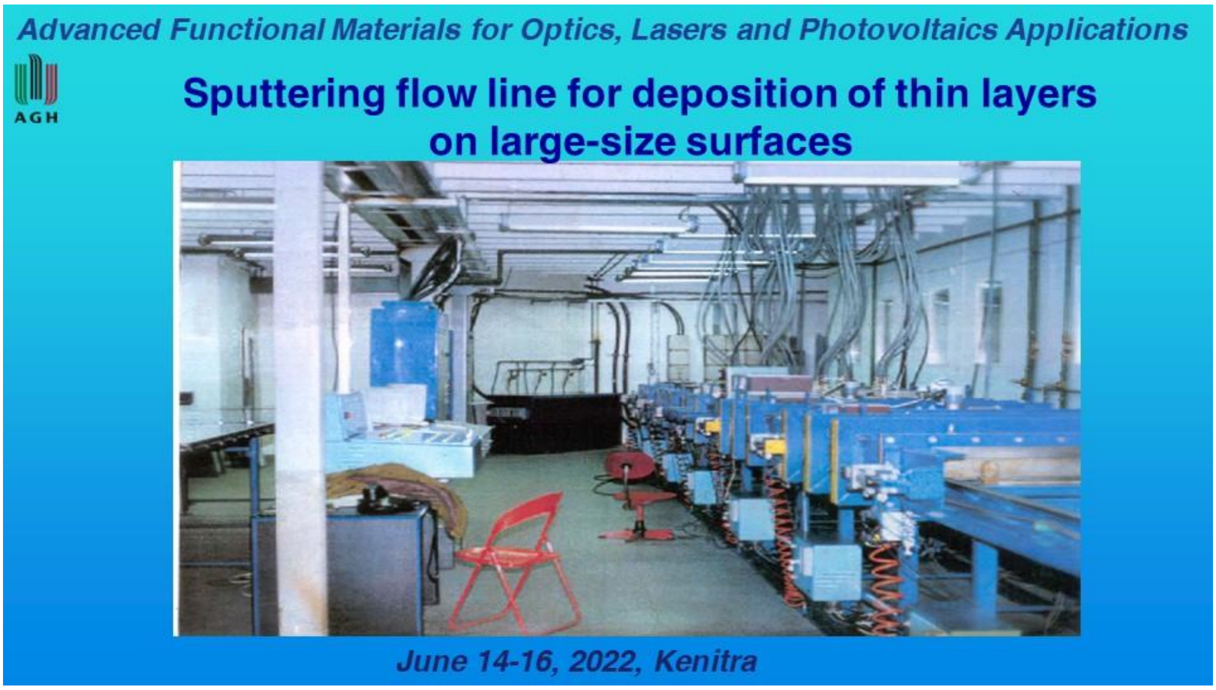

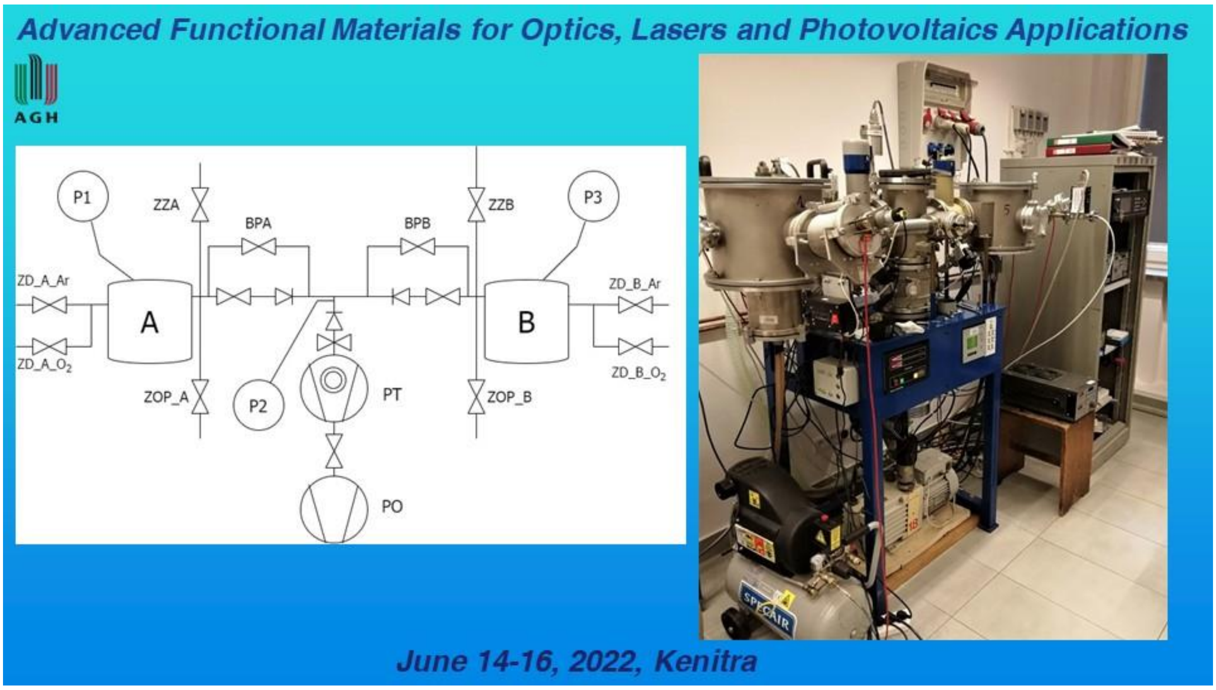

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- In this paper thin film copper oxides deposition and modification with ion implantation method are presented. The samples were prepared using magnetron sputtering method.

- Implantation of Cr+ ions

- The influence of implantation with Cr ions on the structure of the oxides was simulated using **S**topping and **R**ange of **I**ons in Matter software [1].

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- Many energies of ion beam were simulated to analyze the influence of ion beam on the material.
- CuO and Cu_4O_3 thin films were deposited by experimenting with Cr ion implantation with energy of 15 keV and dosage of $5x10^{16}$ ions/cm^2. The CuO films were also implanted with lower energy and dosage: 10 keV and $5x10^{14}$ ions/cm^2.
- Measurements with X-ray diffraction method shows that the crystallinity of the material is decreased with the implantation. i
- AFM Surface investigation
- Elipsometric study

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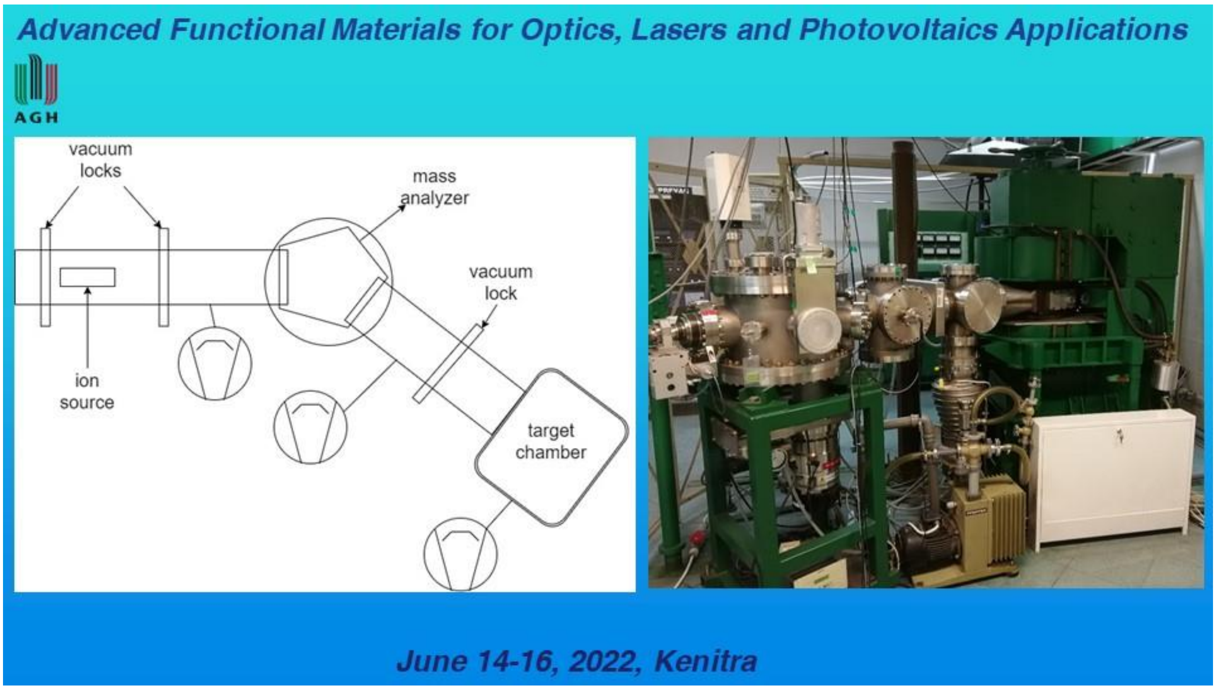

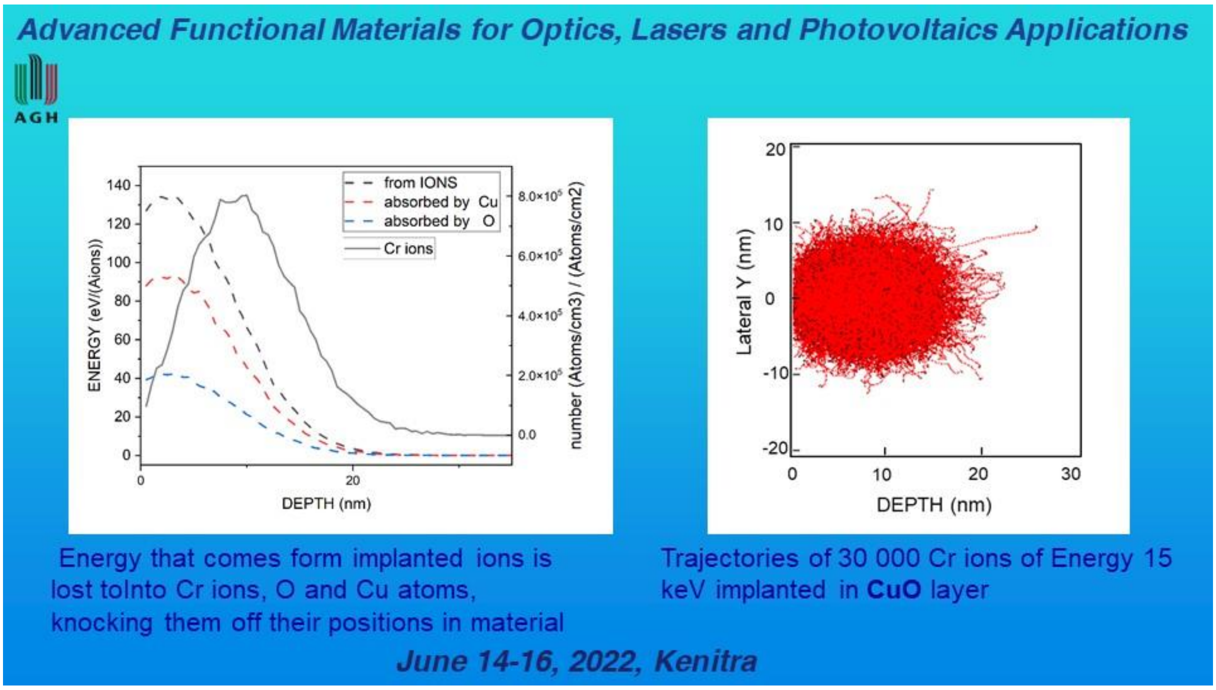

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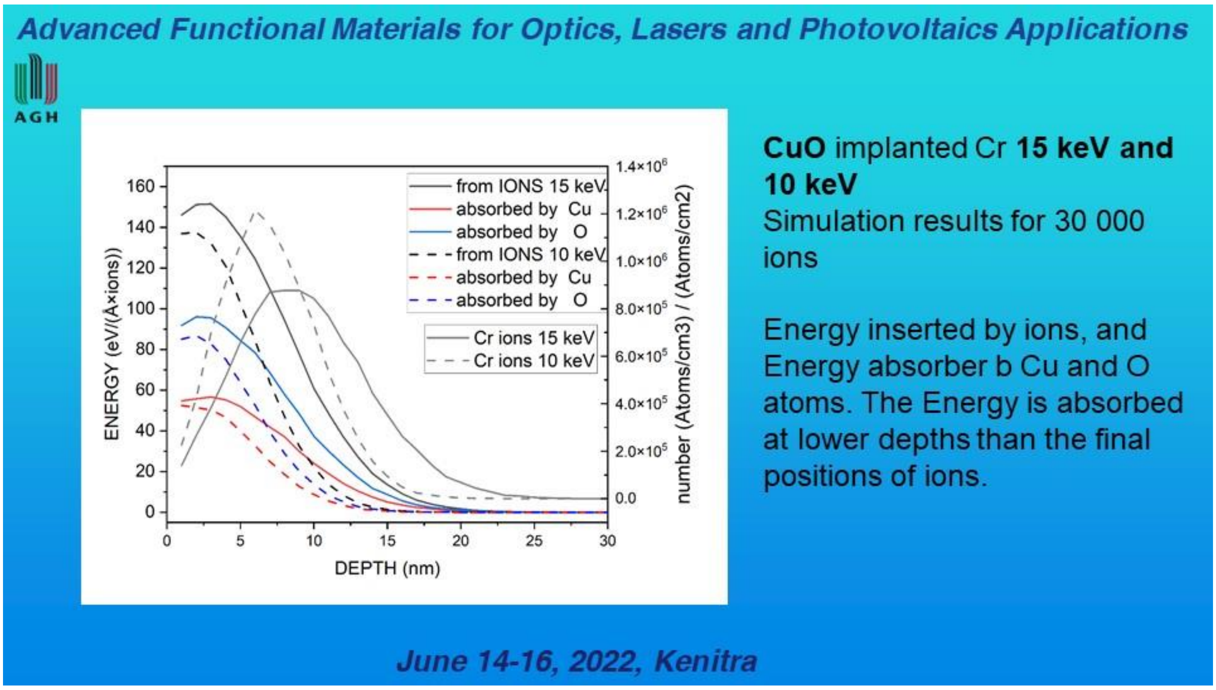

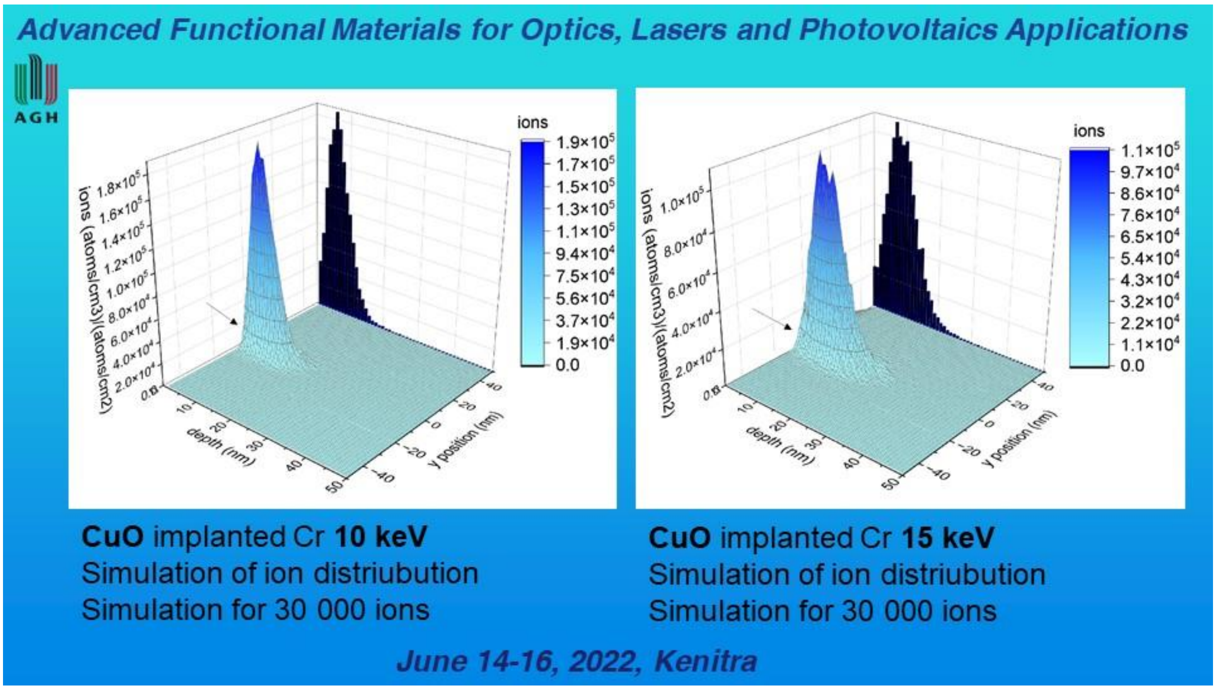

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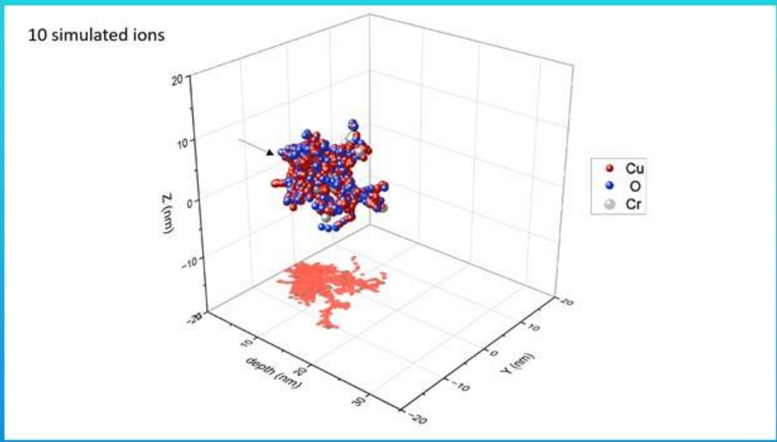

Cu and O recoils created by Cr ions of 15 keV Energy in **CuO**

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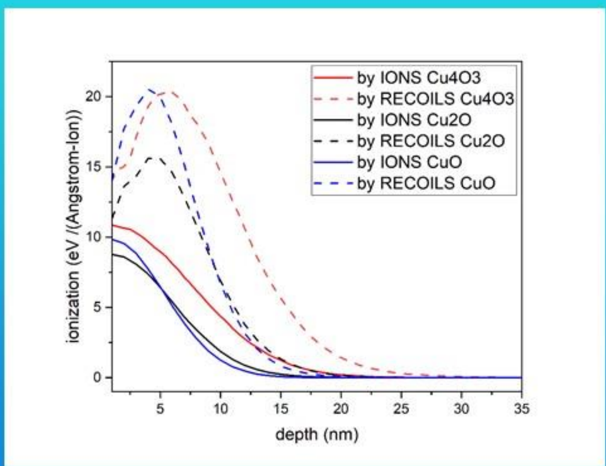

Ionization in the material for all Cu oxides caused by ions directly or by recoils.

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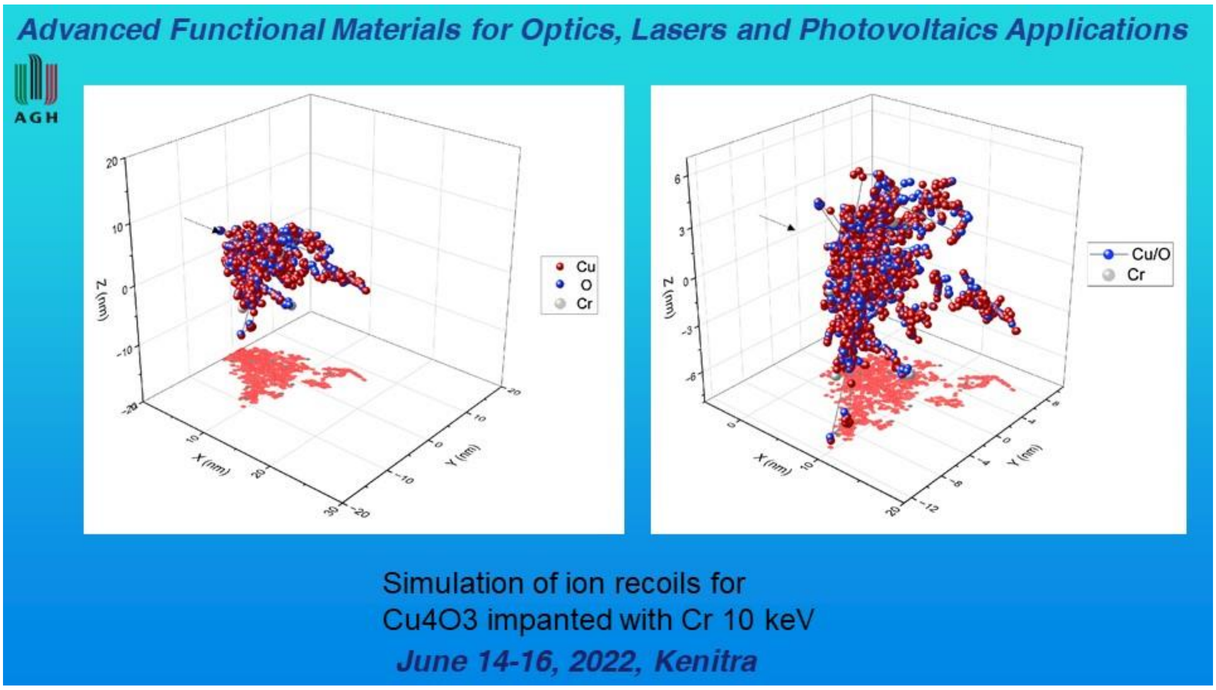

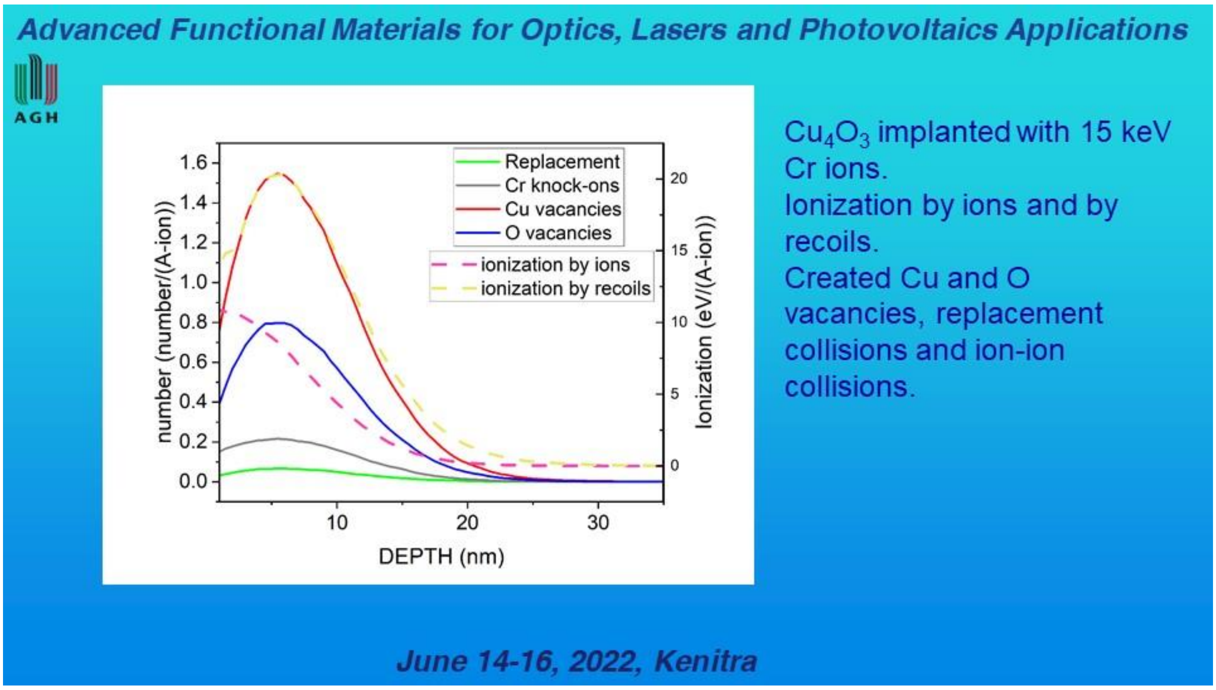

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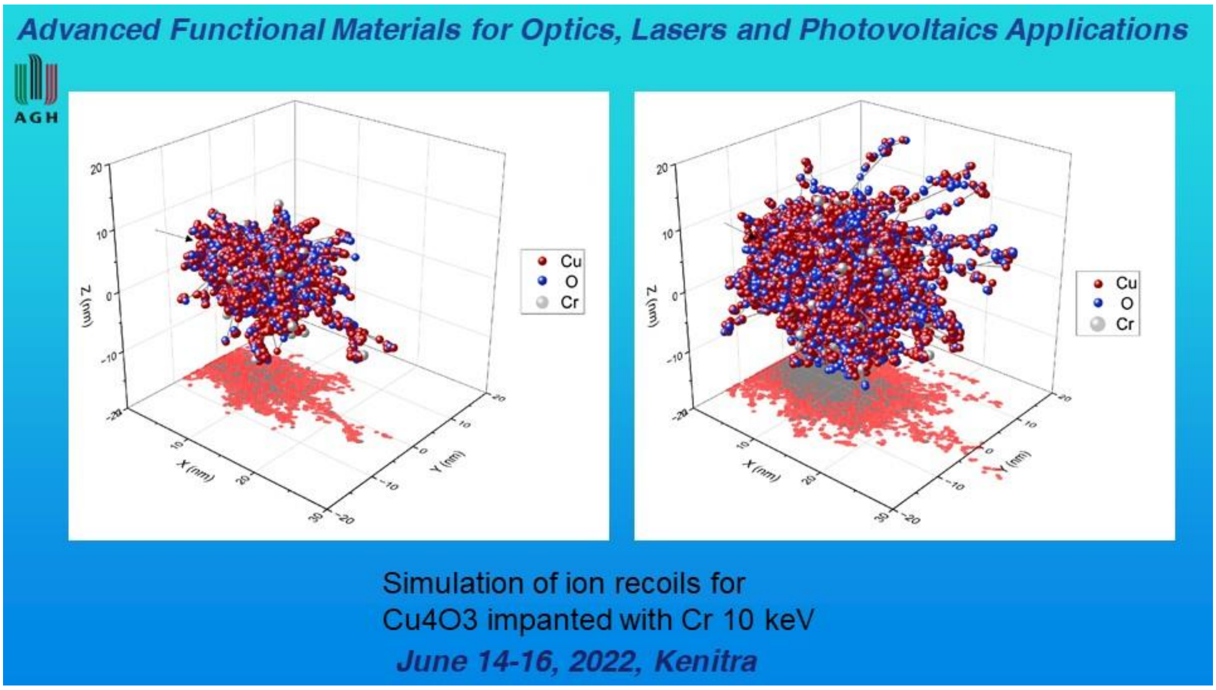
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Cu
O
Cr
Z (nm)
X (nm)
Y (nm)
Simulation of ion recoils for
Cu4O3 impanted with Cr 10 keV
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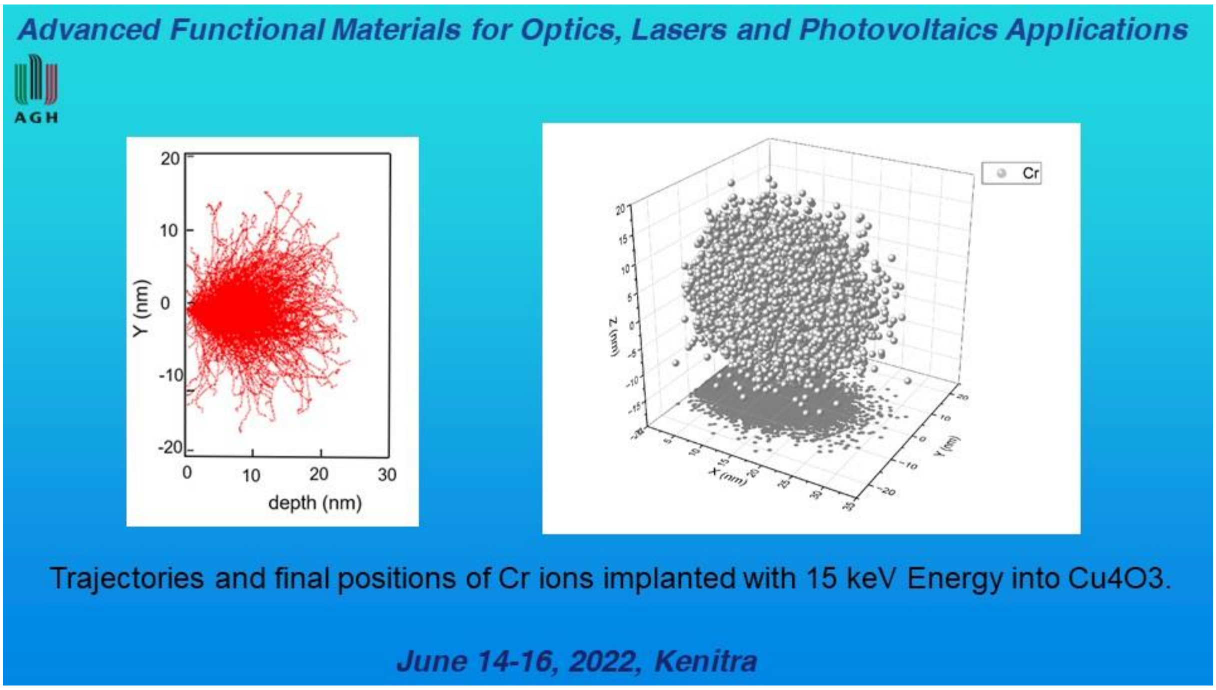
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Y (nm)
depth (nm)
Cr
Z (nm)
X (nm)
Y (nm)
Trajectories and final positions of Cr ions implanted with 15 keV Energy into Cu4O3.
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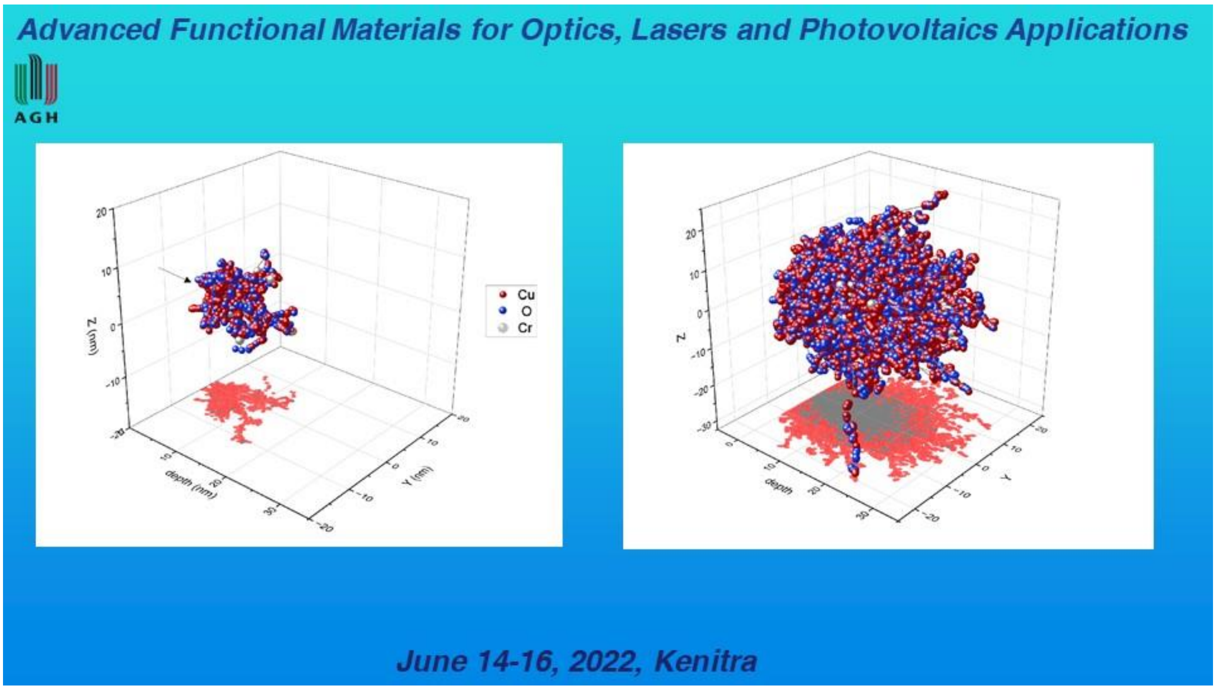

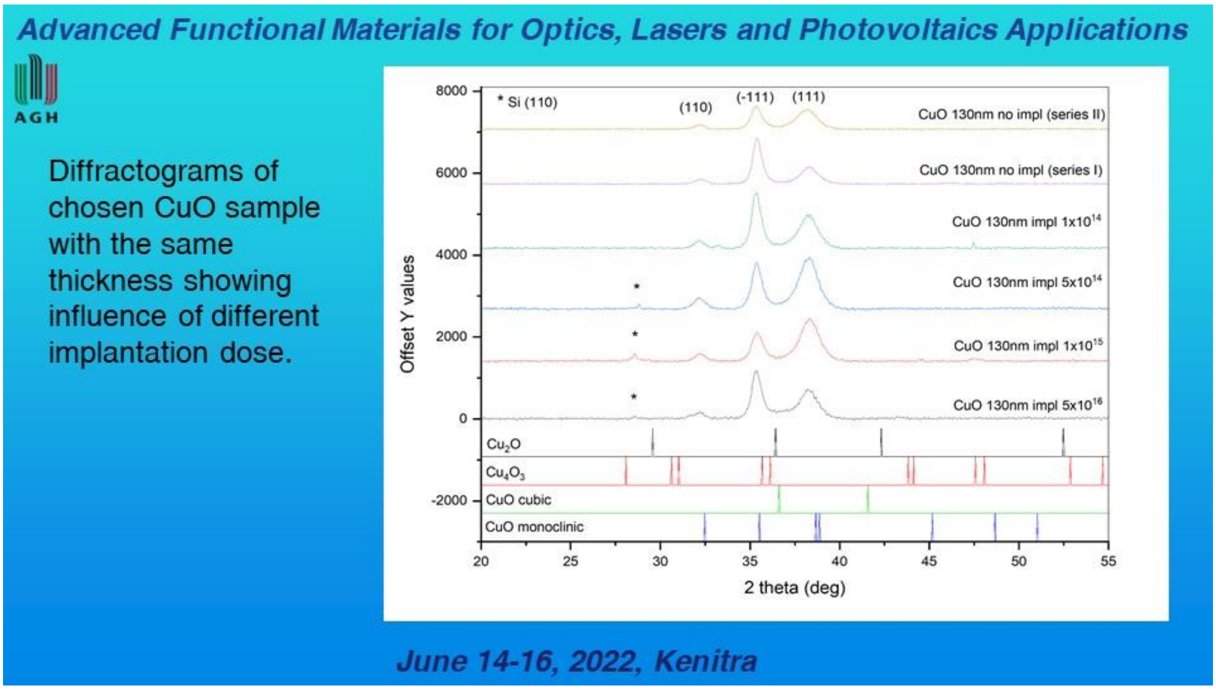

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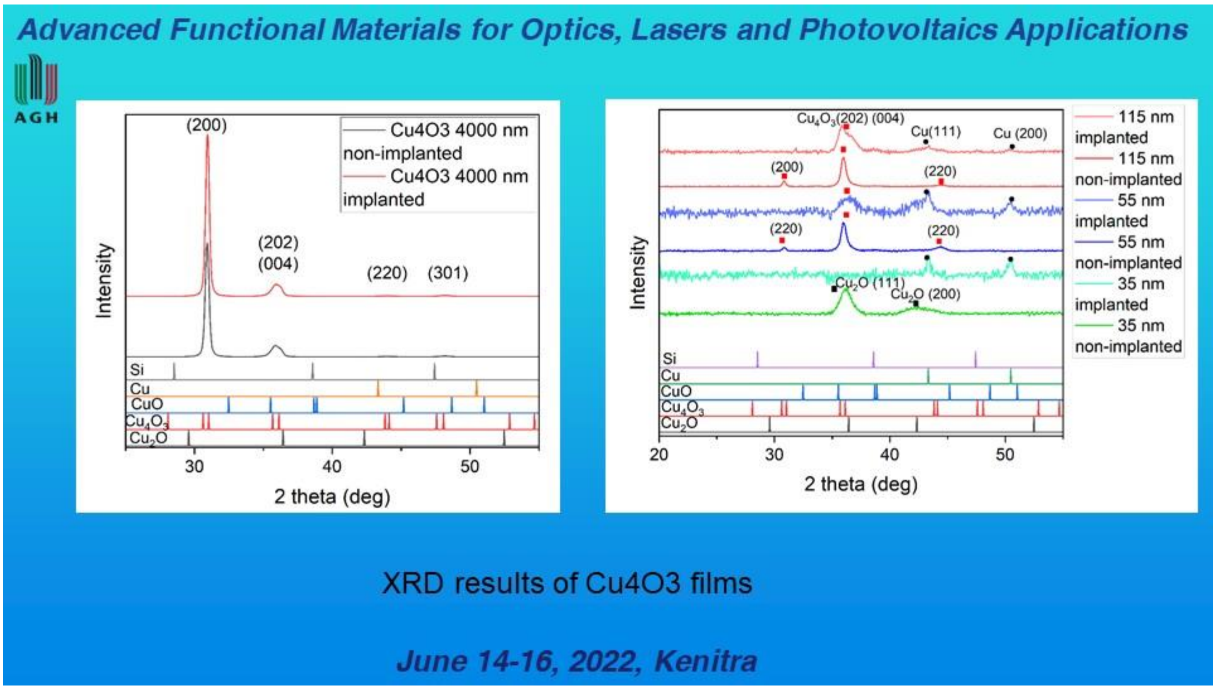

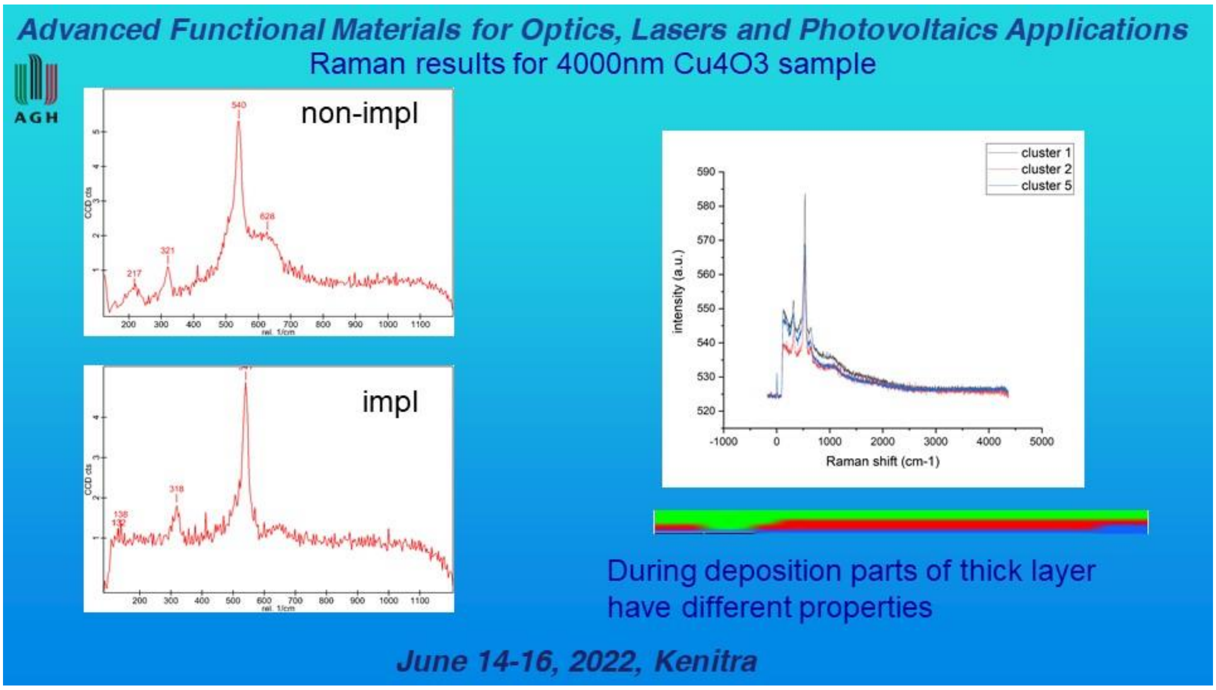

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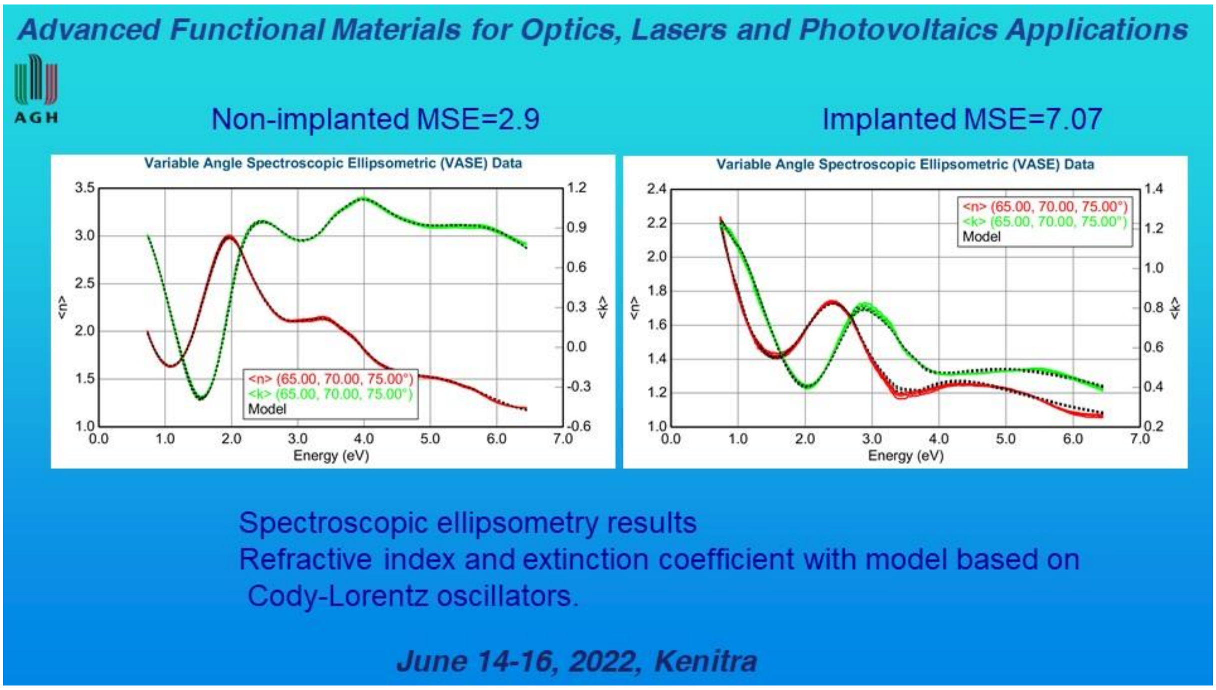

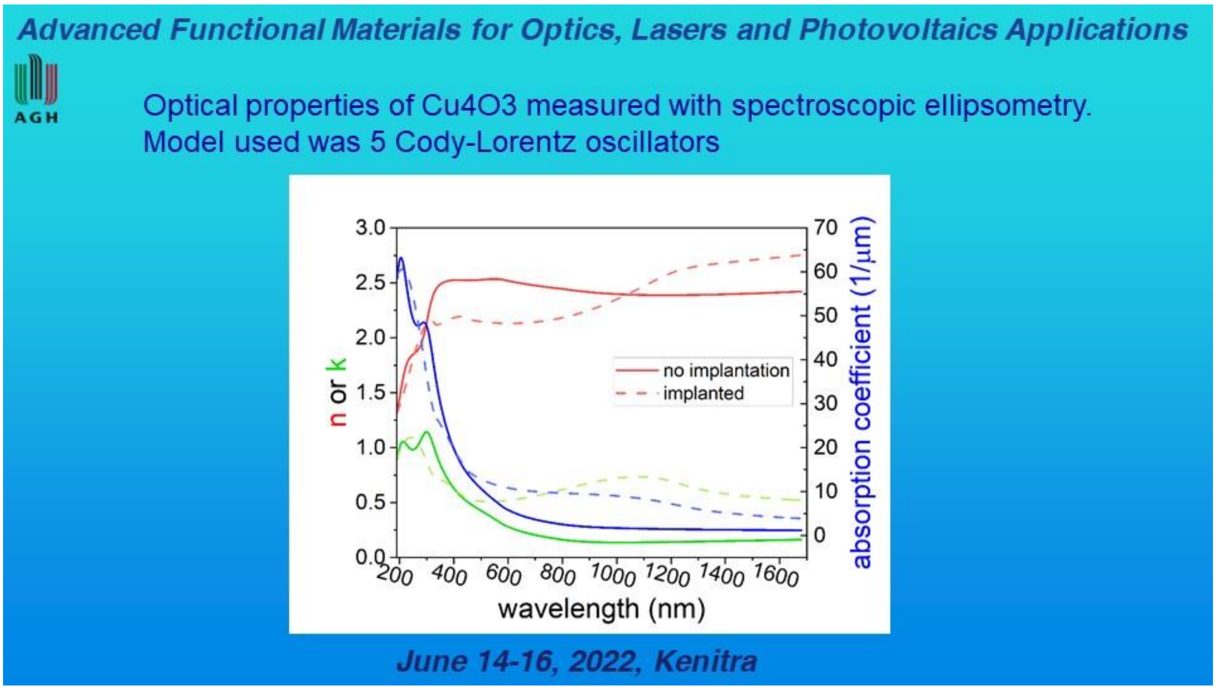

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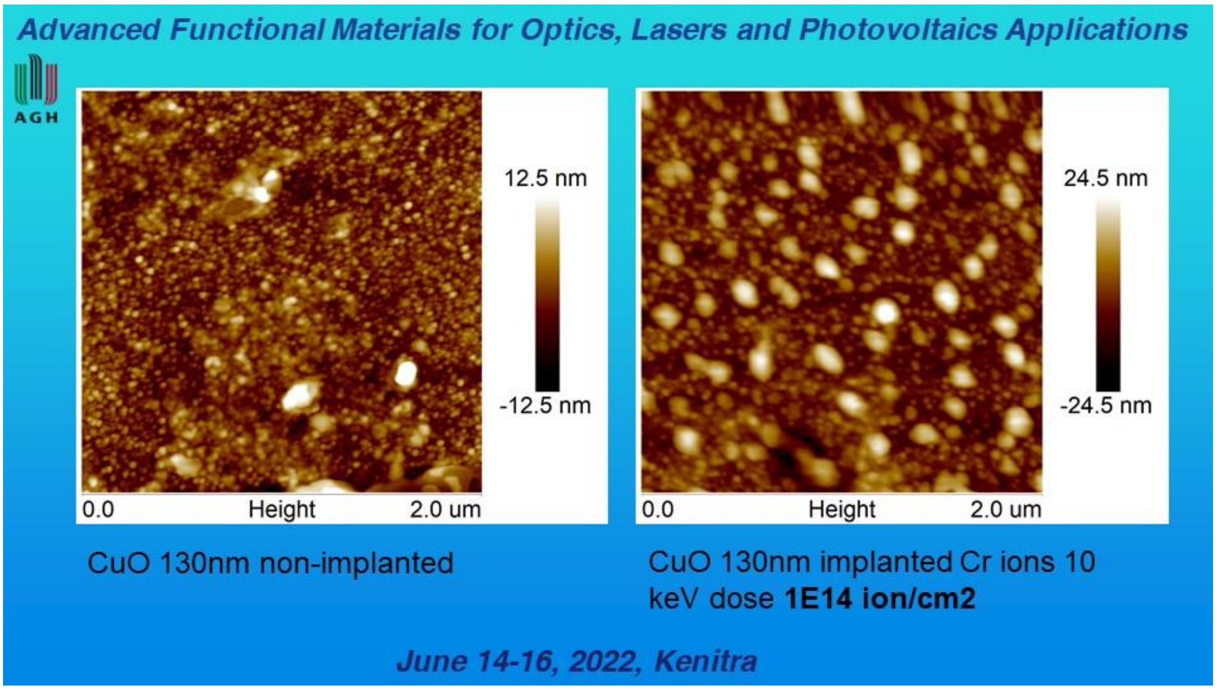

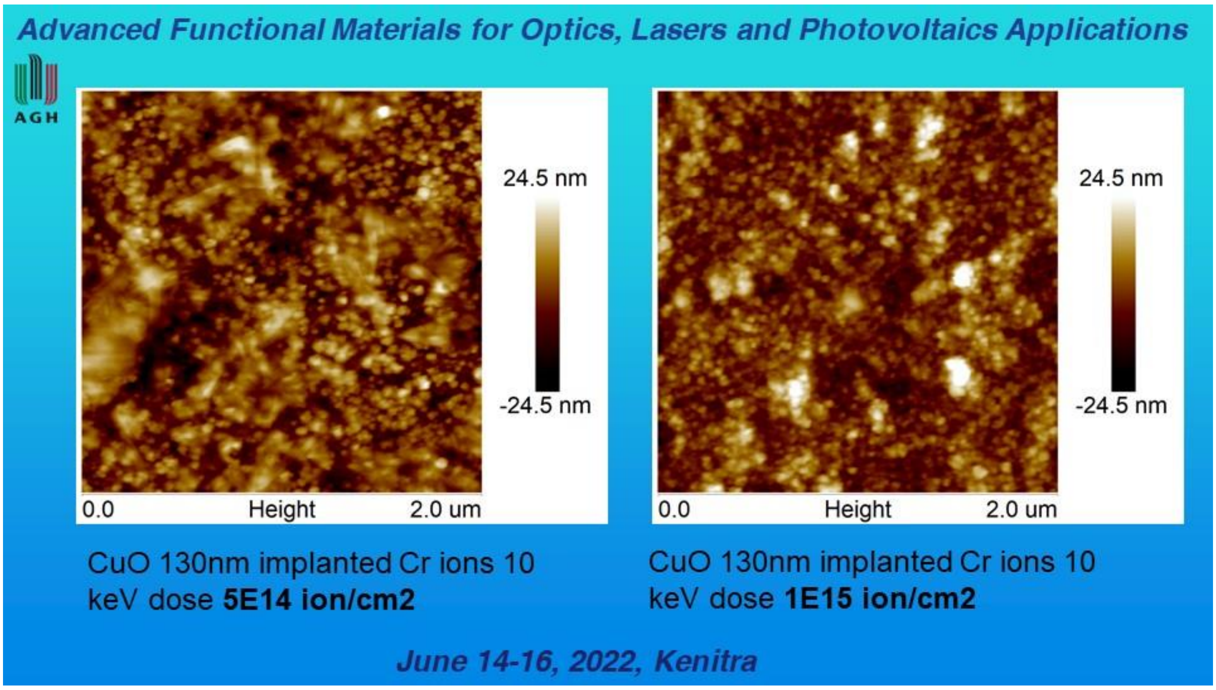

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Prepared samples were investigated with Xray,spectroscopic ellipsometry, and AFM to determine physical properties and changes, such as cristall structure, surface morphology and optical parameters: refractive index and extinction coefficient of thin films.

- Knowing the optical properties of thin film copper oxides, we can state that the ion implantation with Cr is beneficial for their application as absorber layer in solar cells.

[1] Ziegler, J.F.; Ziegler, M.D.; Biersack, J.P. SRIM - The Stopping and Range of Ions in Matter (2010). NIMPB 2010, 268, 1818–1823, doi:10.1016/J.NIMB.2010.02.091.

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