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IUVSTA President's Message

Anouk GALTAYRIES <anouk.galtayries@chimieparistech.psl.eu>

Dear members of the Union Societies, dear Colleagues, dear Friends,

For this message, my first thoughts go to all of us who have suffered in this year 2020, whether directly or indirectly linked to the Covid19, a global pandemic. Obviously, I wish these people that things will improve and to everyone that the next days will not be a source of new personal or professional worries.

What an unimaginable and an unpredictable year it has been!

Apart from the fears related to the health situation in the world, we can, however, look back to the previous months with a certain pride for IUVSTA.

- Pride in having unanimously produced a decision not to participate, even involuntarily, in the spread of the virus, all member societies are committed to ensuring that no scientific or technical event organized in the name of IUVSTA will be held anywhere in the world until all guarantees have been provided. So, we postponed a lot of events either to 2021 or even to 2022, but we also conducted one 100% virtual IUVSTA forum, the International Conference on Thin Films with its advantages and disadvantages. Special mention to the colleagues from the Hungarian Vacuum Society who courageously embarked on the virtual organization this past November, with a high-quality program and a good participation of young researchers (but not only), for whom communicating during the PhD studies is very important. The IUVSTA encouraged its young researchers by granting fifteen IUVSTA ELSEVIER prizes and also by creating a new Award, the IUVSTA Peter Barna Award, to acknowledge the best two oral communications.

- Pride in having kept a united working team around me, which has met every month since May 2020 in order to maintain the connection and to sustain the activities, despite the impossibility of travel internationally.

- Pride of having prepared for 2021 despite the uncertainties that remain: (i) first 100% virtual IUVSTA WS in January on HIPIMS, free and sponsored by IUVSTA, the Swedish Vacuum society and the Chair of the organization, (ii) first proposal since a very long time to honor Peter Barna, Hungary with the title of Honorary President of IUVSTA, (iii) first participation in an international group IYBSSD 2022 of societies that act in favor of an international scientific year in 2022 (Basic Sciences and Sustainable Developments), (iv) first free scientific webinars in association with IOP, and (v) proceeding with caution with a new agenda for our traditional scientific and technical events (EVC16, ECOSS, VASSCA, etc).

The period is also conducive to brainstorming: can we make use of some elements of the newly developed means of communication and reduce the amount of long-distance travel, without compromising or even enhancing the quality of our meetings? Why not renew our logo, build it from the bottom up, based on the results of a survey to "reimagine your IUVSTA"?

I will be proud, together with my colleagues-officers, to work on behalf of the Union so that we best represents its member-societies, the industrial, and scientific partners. Even though locked in our rooms, for the time being, let's use our energy to reimagine the IUVSTA of the 21st century starting in 2021 with everyone's input!

I wish you all a safe and happy new year 2021, less worrying and respectful of all and of the planet!



Anouk Galtayries



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Report on ECM 133, a Teleconference Meeting

Christoph Eisenmenger-Sittner, christoph.eisenmenger@ifp.tuwien.ac.at

ECM 133 was held on Saturday, October 10th, 2020. Again, it was a virtual Executive Council Meeting. Because of the long-dragging Covid-19 situation in many nations of the world, the face to face meeting scheduled from Oct. 9 – 11, 2020 in Suzhou, China, was cancelled, as well as VASSCAA 10 which was scheduled to take place October 12 – 15, 2020 in Shanghai, China. However, the efforts of the Chinese Vacuum Society in managing all aspects of these meetings are gratefully acknowledged.

In their virtual form, ECM 133 and the associated preceding meetings took place on October 8th – 10th. Starting with the Officers Business Meeting and the Committee meetings on October 8th, followed by the Scientific Technical Directorate (STD) meeting on Friday October 9th, ECM 133 was held on Saturday, October 10th, 2020. As we all have become familiar with the use of teleconferencing platforms in the recent months, the meeting went smoothly and was held without any major technical issues. In fact, the virtual format proved to be beneficial for high attendance. As in ECM 132, attendance was sufficient to make, the Executive Council Meeting fully quorate with 80% of eligible votes present.

In her opening statement the President Anouk Galtayries welcomed all IUVSTA Officers, Councillors and Members. She thanked everyone serving in the Union for the fruitful discussions and for the very productive virtual meetings preceding ECM 133. Also, the valuable work done during the months between ECM 132 and ECM 133 was mentioned by the President. Six informal virtual IUVSTA meetings were held May 14th, June 15th, July 17th, August 21st, September 11th, and October 6th, 2020. (Editor's note: two more meetings were held after the ECM133 on 20th November and 17th December. Within these meetings general aspects of running the Union under the given difficult circumstances were discussed. On the positive side of this sad situation for international exchanges, we should consider implementing in the future some of these new ways of communication. The President introduced several important topics to be approved during the ECM 133 meeting, namely:

- i) the participation of IUVSTA in the International Year of Basic Sciences for Development (IYBSD) 2022 as partner organization
- ii) the nomination of Peter Barna as IUVSTA Honorary President for his great services to the Union and his significant contributions to the thin film scientific community, and
- iii) a possible change of the IUVSTA Logo.

After the Presidents statement, the Secretary General, Christoph Eisenmenger-Sittner, gave a brief summary of his report which had been posted in the member section of the IUVSTA website. He also emphasized the importance of the informal IUVSTA meetings and discussions which have highlighted the need for guidelines to organize 100 % virtual events, and the need to revise and adjust some points in the IUVSTA procedures in the pandemic environment. This will be one of the tasks of the Statutes Committee in the next months.

Extensive reports on planned meetings, conferences and workshops were given during the Congress Planning Committee (CPC) report delivered by the CPC chair, Anton Stampfl, within the virtual meeting on Friday. The present crisis made it necessary to shift many of these meetings, however all of them are planned to take place. Still face to face meetings are the preferred format, but also virtual or hybrid formats may be considered by the organizers as alternative options.

The next item on the Agenda of ECM 133 was the STD report. Proposals for one Workshop, one Technical Training Course and one Short Course were considered by STD. All events were recommended to ECM 133 and put to vote. The following events received final approval by the ECM.



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1. The workshop proposal entitled "HiPIMS Today - Recent Development of high-Power Impulse Magnetron Sputtering", proposed by Surface Engineering Division and endorsed by the Nanometer Structures Division was approved as IUVSTA Workshop number 96 with a funding of EUR 3 200.
2. The Technical Training Course entitled "Plasma and Society", proposed by the Philippines Vacuum Society, was approved as IUVSTA TTC number 24 with a funding of EUR 1 930.
3. The Short Course entitled "Gas flows under vacuum conditions: from theory to applications", proposed by the French Vacuum Society, was approved as IUVSTA Short Course in connection with EVC 16 with a funding of EUR 2 000.

After the approval of the above events the President, Anouk Galtayries, highlighted the importance of IUVSTA participation in the International Year of Basic Sciences for Development (IYBSD) 2022 as a partner organization. The focus on sustainability of this UN event will link the work of the Union to society in general and to scientific activities which benefit society. It, therefore, particularly fits the scope of IUVSTA and will also give the national member societies a possibility to showcase their activities. Therefore, this is a great opportunity for IUVSTA to participate and increase its visibility and create impact as scientific organization. The membership of IUVSTA to IYBSD organization is associated with a one-time financial contribution of Eur 10 000, which was unanimously approved by ECM 133 and gratefully acknowledged by Anouk Galtayries.

The meeting continued with the selection of sites for future ECMs and the associated Annual General Meeting (AGM). First, the President proposed to hold AGM 07, due early 2021, again as a virtual meeting between March 15 and March 30, 2021 due to the current Covid-19 pandemic situation This was unanimously approved by ECM 133. Concerning ECM 134 the President proposed to conduct this meeting as a face to face event from June 4–June 6, associated to EVC 16 in Marseille. However, a decision about the specific format of the meeting (fully face to face, hybrid or fully virtual) was left open due to the unclear situation. This approach was also unanimously approved by ECM 133.

After defining the route for future ECMs, Anouk Galtayries asked for a positive vote for Peter B. Barna to be nominated as IUVSTA Honorary President for his work and outstanding service to the Union. Ivan Petrov highlighted his enormous contributions to the international thin film community, fully supporting this proposal. The Nomination of Peter B. Barna as IUVSTA Honorary President was unanimously approved by ECM133, with the formal decision to be taken at the next General Meeting.

Finally, a brief discussion on modifying the IUVSTA logo was initiated by the President. It resulted in the strategy to modify the logo in the spirit of looking to the future, while preserving its history in the spirit of a natural evolution. Miguel Manso offered to write a draft of a call for ideas for a logo to be distributed among the young generation. The draft of this call will be discussed at the next annual general meeting in March 2021.

Before the closing remarks, it was agreed to keep the monthly informal virtual IUVSTA meetings, as they proved to be very constructive as a means to keep up communication between IUVSTA Officers, Divisions and Committees in the time between Executive Council Meetings. After that, the President, Anouk Galtayries, expressed her gratitude to all attendees for their participation in ECM 133 and the Meeting was closed.



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Report on 18th International Conference on Thin Films & 18th Joint Vacuum Conference

Attila Csík, chair of the LOC, csik.attila@atomki.hu

The 18th International Conference on Thin Films (ICTF) jointly organized with the 18th Joint Vacuum Conference (JVC) took place between 22-26 November 2020. The conference was scheduled originally in June but due to the worldwide Covid case it was postponed to November. It was planned as a conventional conference. However, travel restrictions unfortunately did not allow the face-to-face meeting, therefore the Hungarian Vacuum Society, as the organiser of this joint conference, had no other option but to switch to a fully online event – for the first time in the history of both conference series. In this difficult situation our aim remained to provide a platform to exchange new ideas, present recent achievements, and latest results in this scientific community. With the help of AKCongress and Hotel AV Service the meeting was moved to the virtual world and Whova, an online conference platform, was used to manage the conference.



Conference web page:
<https://www.ictf-jvc.com>

For online presentation the participants were asked to pre-record their presentations and send it to the Organization Committee in advance. It helped us to have a continuous flow of the conference program. Of course, live presentations of the latest results were possible, too. The scientific programme was similar as at traditional conferences. The session chair introduced the presenter live, the presenter's pre-recorded video was streamed and at the moment the presentation was over, the presenter could answer questions online. The questions could be put in writing by the audience on the 'Questions&Answers' section of Whova. The necessary technical information was published in due time and a training was organised for the presenters on Sunday evening. The sponsors and exhibitors had their own site inside the Whova where they could upload any information, posters and videos. The participants could visit the 'Sponsors&Exhibitors' page, read and watch information materials during and after the conference.

On Monday the conference started with an Opening session. After the welcome by the chair of the conference, **József Gyulai**, and the welcome speech of the co-chair, **Béla Pécz**, on behalf of IUVSTA the president **Anouk Galtayries** and secretary general **Christoph Eisenmenger-Sittner** presented brief opening remarks. To make a bridge between generations and as a sign of respect for the pioneering work of prof. Péter Barna on the understanding of nanostructural evolution during thin film nucleation, the creation of a new grant for young researchers, "IUVSTA Peter Barna" prize, was announced. The participants also were welcomed by the chair of the Thin Film Division of IUVSTA, **Mile Ivanda**. At the end of the Opening the "Young Scientific Award" was also announced, sponsored by Leybold. A poll was created inside Whova, the participants could make their vote for the best young presenter whose registration fee for the next JVC conference will be covered.

The conference had 151 registered participants from 36 countries with 145 abstracts. Within the 4 days of the conference there were 3 plenary, 15 invited, and 59 oral presentations, organised in two parallel sessions. The plenary lectures were given by **Lars Hultman**, **Jay Hendricks**, and **Martin Aeschlimann** in the field of self-organized nanostructure in functional nitride alloy, photonic quantum-based measurements for vacuum, and plasmonics. Oral presentations were divided into 22 sessions covering the main topics of the conference - Applied Surface Science, Biointerfaces, Plasma Science & Technique, Surface Science & Engineering, Thin Films, Vacuum Science & Technique, Electronic Materials and Processing, Nanometer Structures. 78 posters were presented by uploading PDF files into the personal Whova profiles. During the poster sessions the participants could view the posters, ask questions in the chat window. The participants had possibility to communicate with each other and discuss questions through the 'Community' part of Whova. A Zoom meeting was organized by **Wolfgang Werner** after the poster session on Tuesday – "Let's gather for a beer".



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Before the conference an award sponsored by ELSEVIER was announced for the students. Thanks to the announced "IUVSTA-ELSEVIER Student Award" 15 young scientists were able to attend the conference and present their latest results in form of oral or poster presentations. A list of the 15 awardees' names and institutions is given below.



Behind the live stream – the technical staff of the Hotel AVS Service oversees the proper operation of the system



An on-going session

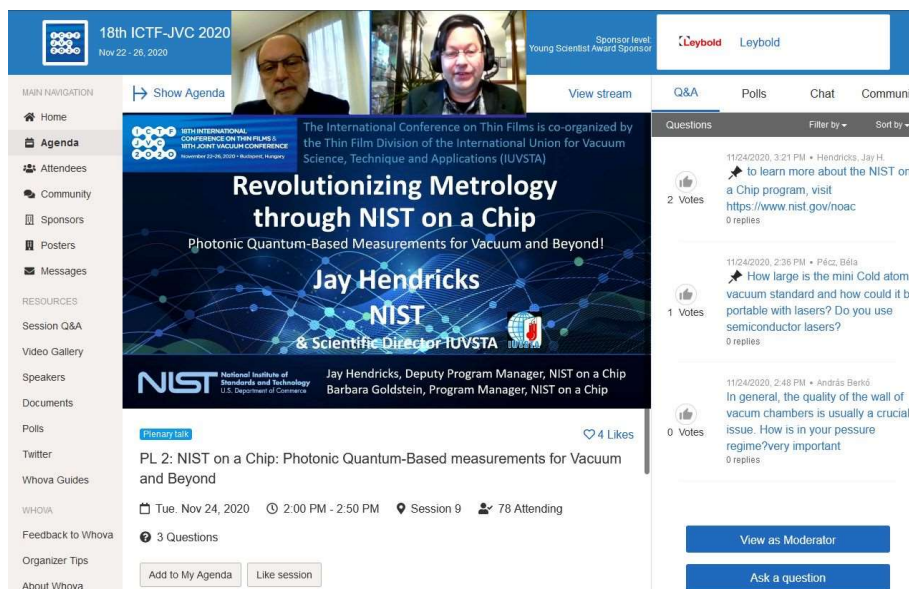
At the Closing event **Anouk Galtayries** and **Christoph Eisenmenger-Sittner** announced the first winners of the 'IUVSTA Péter Barna' award. During the conference time oral presentations of young researchers were evaluated and according to the decision of the committee (A. Galtayries, Ch. Eisenmenger-Sittner and M. Ivanda) the newly created prize goes to **Šárka Batková** (University of West Bohemia, Czech Republic) and **Radovan Vranik** (Johannes Kepler University, Austria). The best "Young Scientific Award" was given to **Gabriella Jáger** (University of Debrecen, Hungary) by the votes of the conference participants in the poll. After the announcement of the winners, Prof. **Peter Barna** gave a short speech (see transcript on page 7) thanking the prize founded by IUVSTA and congratulated the winners. It was announced that the organisation of the next ICTF conference (which will be in 2023) would start next year. The IUVSTA Thin Film Division will provide information to colleagues through the representatives of local vacuum societies. **Andrej Vincze**, in the name of Slovak Vacuum Society in his short presentation invited the colleagues to participate in the next JVC conference, which will be held in 2022 hopefully with personal participation in a beautiful High Tatra region of Slovakia. In his closing speech, **Béla Pécz** expressed his thanks for the work of the colleagues in organizing the conference. Finally, he drew the attention of the participants to the possibility to publish their contributions as selected papers in the special issue of the journal Vacuum or as normal papers in Resolution and Discovery.

The organisers of the conference are gratefully acknowledging the support of the Hungarian Academy of Sciences and IUVSTA. Also, many thanks to the industrial sponsors and partners of the conference: **Leybold, JEOL, SoliVac, Pfeiffer, Hiden Analytical, Quantum Design, Europhysics News, High Tech Institute, Kon-Trade, Hotel AVS**. We are particularly grateful to **AKCongress** and **Hotel AV Service** for their professional and precise work in ensuring the smooth running of the conference. A special thank goes to the technical staff for operating the technical background. The following video gives an impression of how the technical staff provided the live streaming:

<https://m.youtube.com/watch?v=JxOcLEUYrtQ&feature=youtu.be>



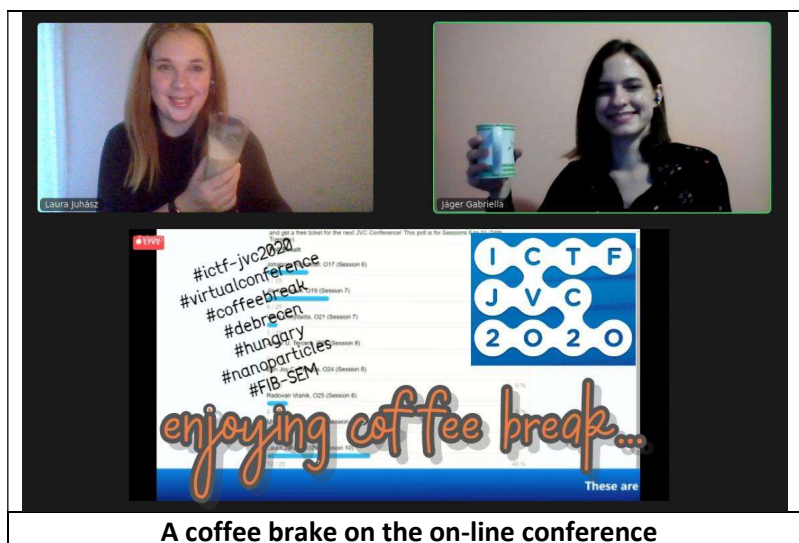
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Screenshot of the live stream. Jay Hendricks gives a live plenary lecture

Names of the IUVSTA-Elsevier Student Awardees

- **Ameer R. K. Nassrah**, *Wigner Research Centre for Physics, Budapest, Hungary*
- **Ádám Szitas**, *University of Szeged, MTA Reaction Kinetics Research Group, Szeged, Hungary*
- **Diogo Costa**, *Physics Centre of the University of Minho, Braga, Portugal*
- **Eszter Bodnár**, *Institute for Nuclear Research, Debrecen, Hungary*
- **Gabriella Jáger**, *University of Debrecen, Department of Solid State Physics, Hungary*
- **Géza Szántó**, *University of Debrecen, Department of Experimental Physics, Hungary*
- **Ivana Šarić**, *Ruder Bošković Institute, Zagreb, Croatia*
- **Laura Juhász**, *University of Debrecen, Department of Solid State Physics, Hungary*
- **Ľubos Podlucky**, *Institute of Electronics and Photonics, Bratislava, Slovak Republic*
- **Marija Tkalčević**, *Ruder Bošković Institute, Zagreb, Croatia*
- **Oleksandr Grynko**, *Chemistry and Materials Science Program, Lakehead University, Canada*
- **Petra Pál**, *University of Debrecen, Department of Experimental Physics, Hungary*
- **Szilvia Gulyás**, *University of Debrecen, Department of Solid State Physics, Hungary*
- **Tomas Lednický**, *Brno University of Technology, Czech Republic*
- **Vladimir Terek**, *University of Novi Sad, Faculty of Technical Sciences, Serbia*



A coffee brake on the on-line conference



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Peter Barna's Speech at the Closing Ceremony of ICTF18/JVC18

Mr. Chairman! Dear Colleagues!

Let me say some few words on the occasion of my awards.

Dear Mrs. President of IUVSTA!

Dear Mr. Secretary General!

I was very touched, and it was a great honour for me that my activities in connection with IUVSTA were so highly appreciated that the Honorary President of IUVSTA has been recommended to be given to me, the highest award of IUVSTA, and IUVSTA has created the IUVSTA Peter Barna Award for students. Allow me to express my gratitude to both of you and the IUVSTA Executive Council for this.

All what I did was driven by my motivation. It has never been tiresome for me. All what I did I saw as a service in the interest of our professional society and researchers during the Cold War period in the East-European countries who had been working isolated from the international scientific public life. I greatly appreciate that the current and past IUVSTA managements understood and supported our efforts continuously. As a result, a great number of the 70 international conferences and workshops organized by us were supported by IUVSTA.

Let me remember my mentors, who were my exemplars in this service and also those who have offered altruistic help to me both from Hungary and from the various parts of the world. They supported and encouraged me. Let me mention Professors **Jenő Póca** and **György Szigeti** among them who helped me get into the international scientific life, into the organization of conferences and schools and showed examples in the selfless service to the scientific society. Let me mention Professors **Joe Greene** and **John Colligon** as well, who regularly lectured at our conferences and, as editors-in-chief, published several conference proceedings.

And finally, when I again express my gratitude for granting me these high honours, I am convinced that IUVSTA will continue to evaluate and reward scientific achievements as wells as selfless service done for our professional community. As Honorary President I would like to help in this matter too in the future



Professor Peter Barna

P.B. Barna



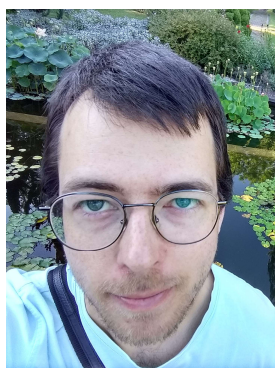
Brief Research Statements by the Winners of the Inaugural IUVSTA Peter Barna Prize



Šárka Batková
University of West Bohemia
Czech Republic

Reactive HiPIMS deposition of nitride and oxynitride films and nanostructured materials with tailored architecture

The main focus of my work is thin film deposition by HiPIMS (High power impulse magnetron sputtering). One part of my research deals with how improving the deposition method itself can enhance the material properties, namely with the effect of positive pulse voltage in reactive HiPIMS on properties of CrN films (S. Batkova et al., Surf. Coat. Technol. 393 (2020) 125773), which is what I presented at the ICTF-JVC 2020 conference and received the award for. Another part of my research focuses on Ta-O-N films, where HiPIMS helps us control the elemental composition and therefore achieve an appropriate O to N ratio with respect to the intended application (J. Capek, S. Batkova et al., J. Vac. Sci. Technol. A 38, 033409 (2020); J. Capek, S. Batkova et al., Ceram. Int. 45 (2019) 9454-9461). Lastly, I have the opportunity to work with a gas-aggregation nanoparticle source, which is capable of producing nanoparticles of various materials that can then be used for example in hydrogen gas sensing (S. Haviar, J. Capek, S. Batkova et al., Int. J. Hydrog. Energy 43 (2018) 22756-22764). Currently we are investigating the effect of the source parameters on Cu nanoparticles.



Radovan Vranik
Johannes Kepler University
Austria

Stable π -radical as potential candidate for Radio Frequency Scanning Tunneling Microscopy study

Scanning tunneling microscopy (STM) and spectroscopy (STS) are powerful experimental techniques which among many applications enable also the characterization of single molecules adsorbed on a metallic substrate. Although they can often yield a rich information about the topography and electronic properties of the adsorbed molecule, there are also many cases where two different molecular species result in an almost identical topography image and electronic spectra and therefore cannot be satisfactorily resolved by this technique. This problem could be solved by adding a small radio-frequency modulation to the commonly used DC tunneling current and searching for resonance frequencies of the studied molecule. In general, there are two categories of molecular resonances which can be studied within the currently accessible range of frequencies

scaling up to several GHz: mechanical resonances such as molecular rotations and single molecule spin transitions. The first category remains still rather a theoretical concept, but single-spin spectroscopy has already been experimentally realized [Müllegger et al., PRL 113, 133001 (2014)]. Among molecules suitable for single-spin spectroscopy, stable organic radicals stand out for their extraordinary magnetic properties and are therefore in the focus of our research [Müllegger et al., J. Phys. Chem. C 116 (2012), Vranik et al., Surf. Sci. 700, 121676, (2020)]. The revealed resonances corresponding to series of spin transitions in adsorbed molecules with a preserved non-zero spin are unique for each type of molecule. Therefore, they could serve as “molecular fingerprints”, helping to resolve species which are not resolvable by the common STM and STS techniques. These are the principle and the aim of radio frequency STS (rf-STs) method which is currently being developed in our RF nano-spectroscopy group at Institute of Semiconductor and Solid State Physics in Linz.



Clio Azina completed the research visit enabled by the 2019 Welch scholarship



Dr. Clio Azina

Dr. Clio Azina completed her research visit in the laboratory of **Jochen Schneider** at Materials Chemistry, RWTH Aachen University, Germany during the first quarter of 2020. The topic of her research is the investigation of the interfacial stability of MAX phases onto Zr-based substrates. To understand the behavior of V_2AlC in extreme environments and to choose suitable diffusion barriers that will limit the diffusion of species from the Zr substrate to the MAX phase coating. She pursued the following three strategies: (i) evaluation of the oxidation resistance of V_2AlC MAX phase coatings, (ii) thermodynamic stability calculations of the considered interfaces to select diffusion barriers, and (iii) synthesis and experimental evaluation of the thermal stability of the MAX phase/diffusion barriers/Zr

substrate assemblies. Part of the results have already been published in C. Azina, S. Mráz, G. Greczynski, M. Hans, D. Primetzhofer, J.M. Schneider, P. Eklund, et al, Oxidation behaviour of V_2AlC MAX phase coatings, *J. Eur. Ceram. Soc.* 40 (2020) 4436 with other manuscripts in preparation. She presented a detailed, 6-page research report to the IUVSTA Award Committee available upon request. Dr. Clio Azina has been invited to present some of her results as a Keynote Speaker next June 2021 at EVC-16 in Marseille. The topic of her presentation is "MAX phase thin films: from design and processing to environmental protection."

Dr. Clio Azina is now a winner of a Marie Skłodowska-Curie Individual Fellowship and since August 2020 she is back in Materials Chemistry, RWTH Aachen University, Germany Aachen to continue her research program.



IUVSTA EBARA Award Winner: Dr. Waqas Hassan Tanveer's Roadway to Success via Industrial Decarbonisation



Dr Waqas Hassan Tanveer

Dr **Waqas Hassan Tanveer** is the first researcher to receive the prestigious IUVSTA-EBARA Award in July 2019 for making sustainable solutions using vacuum based technologies. Dr. Waqas is an Assistant Professor of Mechanical and Manufacturing Engineering at National University of Science and Technology, Pakistan and has been working as a researcher on the EPSRC funded project of "Low carbon jet fuel through integration of novel technologies for co-valorisation of CO₂ and biomass" led by Prof. Mercedes Maroto-Valer at the Research Center of Carbon Solutions (RCCS)- Heriot Watt University. For this project Dr Waqas developed a state-of-the-art Solid Oxide Electrolyser (SOEC) stack system to produce H₂ rich syngas. The SOEC unit

works synergistically with a gasifier working on wood pellets taken from forestry waste. The syngas streams produced go into the Fischer Tropsch unit that converts them into value added products including the jet fuel. This SOEC unit is the biggest system in terms of fuel utilization (>85%) and power production in Solid Oxide fuel cell (SOFC) mode (almost 700W) in Scotland and is the heart of the low carbon process acting as a CO₂ sink. The project won first prize in the category of Transport and was highly commended in the category of sustainability at IET Innovation Award held at London Brewery in November 2019. Currently Dr. Waqas is working for the project SUSTAIN which is a £35M Future Manufacturing Research Hub funded by £10M of EPSRC funds to decarbonize the UK steel industry. Here, his research focuses on the theme of CO₂ capture and utilization (CCUS) and emission management with Dr. Enrico Andreoli at Energy Safety Research Institute (ESRI) Swansea University. Additionally, he has worked as a project manager for Creativity@Home on CCUS from 2019 -2020, where he organized several workshops via facilitators to nurture creative collaboration between academia and industry. Also, Dr. Waqas is Editor and Reviewer of several top tier journals and proposals from universities in UK, UAE & Pakistan related to Low Carbon Energy/Fuel Systems and Artificial Intelligence.