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# GrInShield newsletter

## 2nd

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### ***Partner Presentation-UniOldenburg***

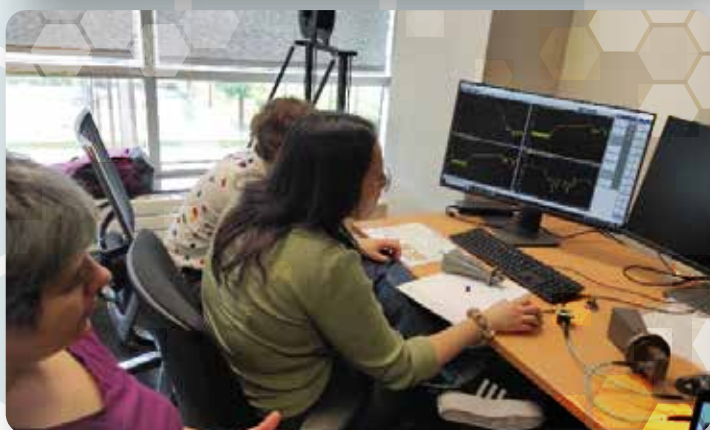
The Carl von Ossietzky University of Oldenburg was founded in 1973. Its mission is to find answers to the key challenges society faces in the 21st century –through interdisciplinary, cutting-edge research and teaching. Its academic and administrative staff work hand in hand and across disciplines. Many are integrated into the University's numerous research structures, which include Collaborative Research Centres, research groups, European projects and European Clusters of Excellence. The University collaborates closely with more than 200 other universities worldwide and also maintains strong ties with non-university institutions active in research, education, culture, business, and industry.

Its status as a key research location is reinforced by its being home to the Helmholtz Institute for Functional Marine Biodiversity, a Max Planck Research Group and three Fraunhofer research institutes as well as a virtual Helmholtz institute. The university has an annual budget of € 263 million with an additional € 83 million in external funding and special funds. The University prepares approximately 16,000 students for professional life in a wide range of disciplines, from the humanities and cultural studies, economics, law and social sciences to mathematics, computer science, the natural sciences and medicine.



## **Courses at IEMN (joint research unit including CNRS & University of Lille)**

One of the tasks of the **GrInShield** project is to raise young researchers' knowledge, expertise and practical skills in the best EU scientific institutions. Thus, VINCA young researchers, Mila Milenković, Slađana Dorontić, Milica Budimir, Jovana Prekodravac and Duška Kleut visited IEMN, France from May 9 – 12, 2023. They attended the class “Know the companies and organizations” held on May 10th by Dr. Emeline Hatchi, the Training Project Manager from the Adoc Talent Management Company, organized by the University of Lille. Visitors had on-site training for measuring electromagnetic interference shielding using a vector network analyzer entitled “An introduction to radio-frequency measurements using Vector Network Analyzer” on 9<sup>th</sup> and 11<sup>th</sup> May. This visit was organized and hosted by RF-2S team (PhD student Cerine Mokhtari and Prof. Dr. Kamel Haddadi) which made the time spent in IEMN fulfilling, and informative from both theoretical and practical aspects!



## **Training for Vinča administrative staff**

The **GrInShield** team bridged the expertise of administrative staff from CNRS, the University of Lille and VINCA. VINCA administrative and legal staff participated in the crucial training organized by the GrInShield project. On June 20th, 2023, partners from IEMN led by Prof. Dr. Kamel Haddadi shared valuable knowledge regarding HE project implementation and management with partners from VINCA.

Sabina Akhuba (CNRS) and Herve Avelin (IEMN) shared their knowledge about project finance roles and HE regulations. VINCA staff involved in the training was from the financial, legal, and procurement department, as well as the scientific staff. This interest indicated the strong enthusiasm and eagerness of various institute offices to empower VINCA's organization in supporting project preparation and implementation. VINCA management clearly recognized the need for a larger participation of the staff in training for improvement of project proposal preparation and implementation assuring the better future of Vinca Institute of Nuclear Sciences.

***First GrInShield Summer School  
(June 26-30, 2023, Divčibare, Serbia)***

**GrInShield** First Summer School was held from June 26- 30, 2023, in **Divčibare, Serbia**. The school was attended by students and lecturers from France, Greece, Germany, Poland, Romania, Slovenia, and Serbia, with 36 participants. Participants from Serbia were from three different Universities:

the University of Belgrade, the University of Novi Sad, and the University of Pristina in Kosovska Mitrovica.



The **GrInShield** team had the privilege to learn from respected Professors well-known worldwide:

Prof. Dr. **Dimitrios A. Giannakoudakis** from the Department of Chemistry, Aristotle University of Thessaloniki, Greece. He received his Ph.D. degree at the City University of New York (CUNY) in 2017, and currently, he serves as a research associate at Aristotle University of Thessaloniki (AUTH). He published more than 115 papers, 4 books, and 5 patents.



Prof. Dr. **Henri Happy**, from the CNRS-IEMN, University of Lille, France. He was selected as “Deputy Leader” of the “Flexible Electronics” work package of the GRAPHENE flagship program, a European Union scientific research initiative with a budget of €1 billion. He published more than 130 papers in international journals.

Prof. Dr. **Gilles Dambrine**, was a Professor of electronics at the University of Lille up to 2020 and a Professor Emeritus up till now. His research interests are concerned with modeling of small signal and noise characteristics in nanoscale high-frequency devices. He is the author and co-author of about 300 papers and communications. He received the IEEE Fellow grade in 2016.

Prof. Dr. **Juan Carlos Colmenares**, worked at the University of Córdoba, Spain (2005–2006), and at the University of Southern California, Los Angeles, USA (2006–2009). Currently, he is working as an associate professor at the Institute of Physical Chemistry of the Polish Academy of Sciences in Poland. He has co-authored more than 120 works published in international scientific journals and books as well as three accepted patents.

Dr. **Didier Théron** joined the National Center for Scientific Research (CNRS in France) in 1990 as a full-time researcher. He is currently working at the Institute of Electronics, Microelectronics and Nanotechnology (IEMN, Villeneuve d'Ascq, France). In 2006, he started working in the field of GaN and Si MEMS resonators for force sensors such as AFM probes or accelerometers. In 2009, in collaboration with Keysight Technologies, he developed an expertise in Scanning Microwave Microscopy coupled to RF interferometry. Since 2013, Dr. Didier Théron is also appointed as a scientific advisor at the Ministry of higher education and research for nanoelectronics. He has authored about 120 publications and communications.

The GrInShield team appreciates you for sharing your knowledge with us and our young colleagues!

Members of the GrInShield project shared their profound knowledge in the field of carbon-based nanomaterials, their production, modification, and analysis with an emphasis on the application in the electromagnetic shielding films. Dr. Dejan Kepić (VINCA), Dr. Biljana Todorović Marković (VINCA), Prof. Dr. Kamel Haddadi (IEMN), Prof. Dr. Miroslav Huskić (FTPO) and Dr. Zoran Marković (VINCA) give outstanding lectures regarding carbon-based nanomaterials, their production and processing of polymer-carbon based nanomaterials, microwave and multiscale non-destructive testing: techniques, tools, and applications. In addition to the theoretical knowledge, participants were also trained to measure and analyze the electromagnetic shielding efficiency of the materials, Raman and photoluminescence spectra, and atomic force microscopy images. Thanks to Cerine Mokhtari, Mohamed Sebbache, Clément Lenoir, Jovana Prekodavac, Slađana Dorontić and Milica Budimir.

### **First GrInShield OnSite training in Vinca**

The **GrInShield** team hosted the First On-site training „**Thin film deposition techniques**“ at the Vinca Institute of Nuclear Sciences, Belgrade, Serbia, from August 23-26, 2023. The participants learned about **GrInShield**, carbon nanomaterials, their characterization, thin films, electrochemical deposition, electrochemical synthesis of graphene and graphene quantum dots, contact angle measurements, and atomic force microscopy. The program combined the theoretical introduction to carbon-based nanomaterials, the structure and main properties of graphene, graphene quantum dots, carbon nanotubes, and their applications followed by the characterization methods for carbon-based nanomaterials, including sample preparation, instrumentation, and data analysis. The participants were involved in the measurement of the conductivity of the obtained thin films of different samples using a 4-point probe system, contact angle measurement, and others. In the end, they visited Vinča-Belo Brdo archaeological site, from the Early Neolithic period with a guided tour organized by the **GrInShield** team.



### **Second GrInShield's Workshop at FTPO**

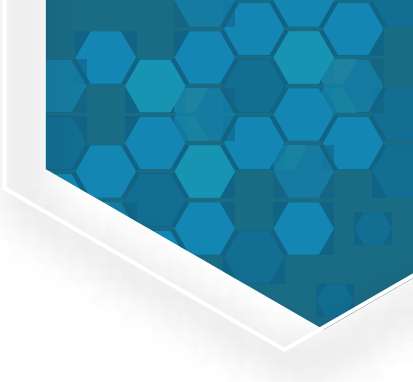

The second **GrInShield's** “**Workshop on polymers, synthesis, characterization and 3D printing**” was dedicated to polymer technologies. It was conducted from September 11-13, 2023 at the Faculty of Polymer Technology, in Slovenj Gradec, Slovenia. The focus on the first day was a general introduction to polymers and polymer synthesis. The workshop could be attended online as well. After the theoretical part, participants also worked on the synthesis and preparation of PA6, UV polymerization, and polymer membrane.



On the second day of the workshop, topics like the determination of the molecular structure of polymers, the thermal, mechanical and dynamic mechanical characterization of polymers, the rheology of polymers, and the importance of processing were presented. Practically, participants learned how to do the determination of glass transition temperature ( $T_g$ ) and melting temperature ( $T_m$ ) by DSC, to study the thermal stability by TGA, and the mechanical and thermomechanical properties by tensile test and DMA.

The third day was devoted to 3D printing. Lectures on the overview of additive technologies and the development of graphene oxide-modified photocurable resins for vat photopolymerization additive manufacturing were particularly important subjects for the participants of the **GrInShield** project as well as other WS attendees. During the practical work, the participants learned how to use the equipment available at the FTPO for Selective Laser Sintering (SLS), Fused Deposition Modeling (FDM), and Digital Light Processing (DLP).





The event was hybrid, available both online and onsite. To enable online participants to follow also practical work Hololens technology was used. There were a total of 47 participants from 11 countries, including India and USA.

### **Conference attendees**


The GrInShield team attended conferences related to carbon-based nanomaterials production and analysis, and those focusing on their microwave characterization. Our team made a joint effort to reach out to the scientific community across the world.

GrInShield's young Ph.D. graduate, Slađana Dorontić participated at Graphene Week 2023, in Gothenburg from September 04-08, 2023. It is one of the world's most well-known conferences in the field of carbon nanomaterials. Dr. Slađana Dorontić's study attracted great attention, created new connections, and generated new ideas. The GrInShield team met researchers, industry leaders, and policymakers from all over Europe.

A leader of the FTPO team in the GrInShield, Prof. Miroslav Huskić presented the lecture on "The influence of reaction conditions on the properties of graphene oxide", in Portorož-Portorose, Slovenija from September 13 to 15, 2023 at the SCS Annual meeting Conference, organized by the Slovenian Chemical Society. Prof. Dr. Miroslav Huskić explained how the reaction conditions influence the graphite particle size, oxidation level, and thermal stability.

The GrInShield team participated at the annual International Conference on Manipulation, Automation and Robotics at Small Scales (MARSS), organized by the microrobotic community and technically supported by IEEE-RAS and IEEE-NTC, from October 09-13, 2023, in Abu Dhabi, UAE. Prof. Dr. Kamel Haddadi, IEMN leader in the GrInShield, presented a lecture entitled "Automation and nanorobotics for microwave sensing" in the session chaired by the leader of the UniOldeburg team, Dr. Muhammad Yasir. A lecture on "Monolayer graphene sheet qualitative and quantitative characterization by using AFM-based SMM" was presented by Dr. Muhammad Yasir.

GrInShield's PI Dr. Jovanovic presented a paper on "New graphene-based composites in electromagnetic interference shielding", while Dr. Kleut presented his work on "Microwave Electromagnetic Shielding with Free-Standing Composites Based on Graphene Oxide and Silver Nanowires" in the special session on "Microwave multiscale modelling and characterization" chaired by Prof. Dr. Kamel Haddadi, IEMN leader and Prof. Dr. Mohamed Abou-Khousa, Khalifa University, UAE.





**GrInShield in COMMUNICATION ACTION:** Science Fair, VINCA OPEN DOOR, and Researchers' Night in Belgrade

The **GrInShiled** team spread the news about carbon nanomaterials and electromagnetic interference shielding! Many children with their parents and teachers learned about pencils, diamonds, and 3D with us several times!





The 16th Science Fair was held from June 17-19, 2023, with over 18000 visitors, and became one of the largest events in the region. It was organized by the joint action of 56 institutions. The **GrInShield** team made interesting stages for making graphene and blocking visible electromagnetic waves!



The youngest visitors learned how Geim and Novoseolov isolated graphene and won a Nobel prize.



Then we opened the doors of our laboratory on Monday 25th September 2023!

The **GrInShield** team hosted a visit as part of the VINCA OPEN DOOR event at the VINCA Institute of Nuclear Sciences where the lab and new equipment were demonstrated.

Partners from VINCA and FTPO joined forces in presenting our research at the European Researchers' Night in Belgrade, Serbia, at a beautiful Museum of Science and Technology on 29th September 2023.

In the inspiring atmosphere of the Museum, the young visitors did 3D printing with the **GrInShield** team the Batman figurines stole the spotlight!

Thanks to these events the emerging issues regarding electromagnetic wave pollution are being discussed and public awareness of this modern pollution is raised.

## *Our new equipment*



### ***From the idea to the three-dimensional object***

We are happy to announce the purchase of our first 3D printer. The Original Prusa i3 MK3S+ combined with PLA filament proved to be an excellent choice for beginners in the field of 3D printing. We are especially thankful for the huge base of downloadable 3D models ready to be printed. And the kids just loved the Batman logo we printed for them at the Researchers' Night.

### ***Know your pH***

Among several ways to measure "the potential of hydrogen", a portable pH meter is one of the best and the most accurate solutions. We have also made room for our lab's Mettler Toledo SevenDirect SD20 pH meter. Its main features are a large colored touchscreen, calibration, and the data entry which is easy and the instrument stores data like timestamps, samples, and sensor ID with every measurement and prints or exports records automatically.

### ***Vacuum filtration at the reach of the hand***

The field of carbon nanomaterials cannot be imagined without the need for vacuum filtration at a certain time. Hence, we bought a complete vacuum filtration system equipped with a Millipore Millivac Maxi vacuum pump that is lightweight and portable. Besides this, the filtration is fast and easy and a series of graphene thin films can be prepared which are ready for characterization in no time.

### ***Actions with other EU projects***

**GrInShield** PI Dr. Svetlana Jovanović shared the project success story in a training session held between May 03-10, 2023): "Training for the project proposal preparation for the Twinning call" with 27 participants from 10 research institutions along with coordinators of TwiNSolCECs, PFAStwin, and UR Data Project projects.

Dr. Svetlana Jovanović participated in the round table discussion during "Post-award grant management training" together with Prof. Dr. Miroslav Savić, the head of the work package within the H2020 project "Preclinical prediction of unwanted drugs on the nervous system", Biolaweb PI Dr. Milos Ćirić and Stepupiors PI Dr. Milena Čavić on Wednesday, October 4th, 2023 in Belgrade.

## Publications

GrInShield's first scientific paper summarizes the research done in the field of electromagnetic shielding using graphene-based composites, "**A review on graphene and graphene composites for application in electromagnetic shielding**". It was published in Graphene and 2D materials on October 18<sup>th</sup>, 2023! The full paper is available on link <https://link.springer.com/article/10.1007/s41127-023-00065-3>.



## Career development in the GrInShield

The youngest member of the GrInShield team, a PhD student, Mila Milenković, became a **Research Assistant**. The GrInShield team congratulates Mila on her success!

GrInShield

## Follow us

To register in GrInShield's diffusion list, please contact Svetlana Jovanovic at [grinshieldtwinning@gmail.com](mailto:grinshieldtwinning@gmail.com)

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Here you can find important news and the biggest achievements of the project. Make sure to subscribe to GrInShield's profiles so you don't miss any of our upcoming events. Also, we launched a website - [grinshield.eu](https://grinshield.eu) - where you can find all the relevant data about the project.

