



Funded by  
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GrInShield

3rd  
newsletter

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### **Partner Presentation - FTPO**

Faculty of Polymer Technology (FTPO) is a young (est. in 2006), small, private and non-profit faculty. It is located in the northeast part of Slovenia, in the small city of Slovenj Gradec. The founders of FTPO are the Municipality of Slovenj Gradec, several companies, and institutions. It is the only institution in Slovenia and in the Balkan region that offers a holistic study program on polymer technology and focuses its research on this important topic.

Since the establishment, the goal of the employees was to focus more, but not solely, on applied science, especially in the biomaterials field. Through strong collaboration with the industry and research organisations within Slovenia and abroad, FTPO was able to obtain several research and collaborative projects, which enabled the purchase of a lot of equipment for polymer synthesis, (from gram scale to 2 kg/batch), characterization (DSC, TGA, DMA, digital microscope,...) and processing (Twin screw extruder, injection moulding machine, several 3D printers...). Some of the processing equipment was also donated by various companies (Arburg injection moulding machine, Laser engraving machine,...)

A part of the research equipment is unique in Slovenia such as Flash DSC and 2.5 L metal reactor specially designed to synthesize even the most viscous polymers, such as PET.



In less than 15 years FTPO developed from the school with only glassware in a laboratory into a respected and well-equipped research and educational institution. It is the leading institution in Slovenia in the field of polymer processing.

Faculty developed good cooperation with the industry as well as with research and educational institutions in Slovenia, Serbia, Austria, Swiss, Hungary, Spain and India.

One of the results of cooperation is also the project **Grinshield**. The role of FTPO in **Grinshield** is mostly to support partners from Vinča with knowledge about polymers, polymer processing, especially 3D printing and characterisation.



### **GrInShield at conferences**

**GrInShield's** youngest participants participated in several Conferences. Two PhD students participated at “The 29<sup>th</sup> International Symposium on Analytical and Environmental Problems”, organized by the University of Szeged, Hungary, and held online between 13-14 November 2023. This Conference is dedicated to ecology and environmental protection so the **GrInShield** research was a perfect fit.

PhD student Mila Milenkovic presented a paper „Graphene oxide-silver nanowires composites for protection against modern pollution – Electromagnetic waves”, while PhD student Anđela Stefanovic presented the study with the title “Measurement of EMI shielding performance of graphene oxide and electrochemically exfoliated graphene thin films”. Both papers address the issue of pollution by electromagnetic waves and discuss potential solutions for it.

On November 30<sup>th</sup>, 2023, **GrInShield's** PhD student Anđela Stefanović shared her results at the 21<sup>st</sup> Young Researchers' Conference organized by the Materials Research Society of Serbia, in Belgrade, Serbia.

Anđela presented the research „Measurement of EMI shielding performance of graphene oxide – silver nanoparticles composites”.

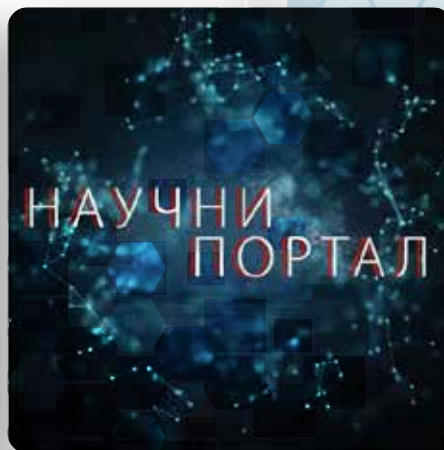
During 2023, **GrInShield's** University of Oldenburg leader, Dr. Muhammad Yasir, and GrInShield PI Dr. Svetlana Jovanović became members of the **Program Committee** of the Conference on Manipulation, Automation and Robotics at Small Scales (**MARSS**).

This year GrInShield team is preparing a Special Session dedicated to shielding nano-materials at **MARSS 2024**.

### **GrInShield at TV**

Leader of **GrInShield's** Work Package for education and training Dr. Milica Budimir and **GrInShield's** PI Dr. Svetlana Jovanović were guests on the TV show „Naučni Portal“, at Serbian National TV, Radio Television of Serbia, channel 2, and talked about activities in the first project year. The TV show was premiered on January 30<sup>th</sup>, 2024.





### ***GrInShield organized the lecture***

Leader of the German research team in the **GrInShield** project, Dr. Muhammad Yasir presented profound ongoing research from the Division of Microrobotics and Control Engineering (AMiR), founded by Prof. Dr.-Ing. Sergej Fatikow at Carl von Ossietzky University of Oldenburg. The lecture was presented on January 31<sup>st</sup>, 2024 in the celebration Hall of Captain Miša's Mansion and gathered guests across the University of Belgrade.



## Publications

A new **GrInShield** research paper is studying the effects of graphite particle size and reaction conditions on reaction yield, structure, and properties of graphene oxide (GO)! One of the main findings is that the reaction yield does not depend much on the reaction conditions but mainly on the method of purification. The more water is used for purification the lower the reaction yield. In our work, we used little water, and we obtained extremely high yield, but the XPS analysis showed that the purity of our GO is comparable to others. This is very important for economic reasons.

We found that the structure of GO changes when it is dried. Differences in chemical composition are difficult to prove, but this can be clearly seen from particle size measurements. After dissolution in water, the dried samples are on average 50 % larger than the undried samples.

In the literature, we also find large differences in the course of the thermal decomposition of GO. This is often explosive, especially at the normal heating rate (10 °K/min), but sometimes higher rates have been used and good results obtained. We have found that the rate of decomposition depends mainly on the method of drying GO or, better say, the size of the particles, and less on the conditions of synthesis or purification. high yields, yet XPS analysis showed that the purity of our GO is comparable to others.

It was published in *Nanomaterials* **2024**; <https://doi.org/10.3390/nano14030281>

## Career development in the GrInShield team

Our team member, Dr. Slađana Dorontić became a Research Associate. The **GrInShield** team congratulates her on her astonishing results and commitment to research!





### ***GrInShield connecting with the international business sector***

GrInShield team participated in the "**Big Science Business Forum 2024**" promotional event jointly organized by the Italian Ministry of Foreign Affairs and International Cooperation (MAECI), the Central European Initiative (CEI), the Region Friuli Venezia Giulia and the organizing committee of the Big Science Business Forum (BSBF) at the Embassy of Italy. His Excellency Ambassador Luca Gori hosted this event and created the opportunity for scientists to meet company representatives, and gather experience from Serbian start-ups.



### ***Students from Sarajevo visiting VINCA***

Students from III Gymnasium, Sarajevo, Bosnia and Herzegovina visited our institute and stepped for a while into the **GrInShield** world on March 1<sup>st</sup>, 2024. Together we 3D-printed and learned about the importance of EMI shielding materials in modern society. Our young visitors shared with us their interests, and a few future chemists were spotted. It was inspiring to see so many young bright minds led by amazing and dedicated professors!





### ***The second GrInShield OnSite training***

The second **GrInShield** on-site training was organized from 19-21 March 2024, at Carl von Ossietzky University of Oldenburg. During the intensive training entitled “Object manipulation at the nanoscale level” various samples were analyzed using state-of-the-art techniques. Dr. Muhammad Yasir and his team: Dr. James L. Mead, Dr. Waldemar Klauser, Warda Saeed, Shakir Ullah, and Dr. Liang Ma studied with the VINCA team, the morphology and electrical properties of graphene-based composites produced in VINCA, bringing the **GrInShield** team one step closer to the goal of producing efficient EMI shielding materials.



### ***Midterm review***

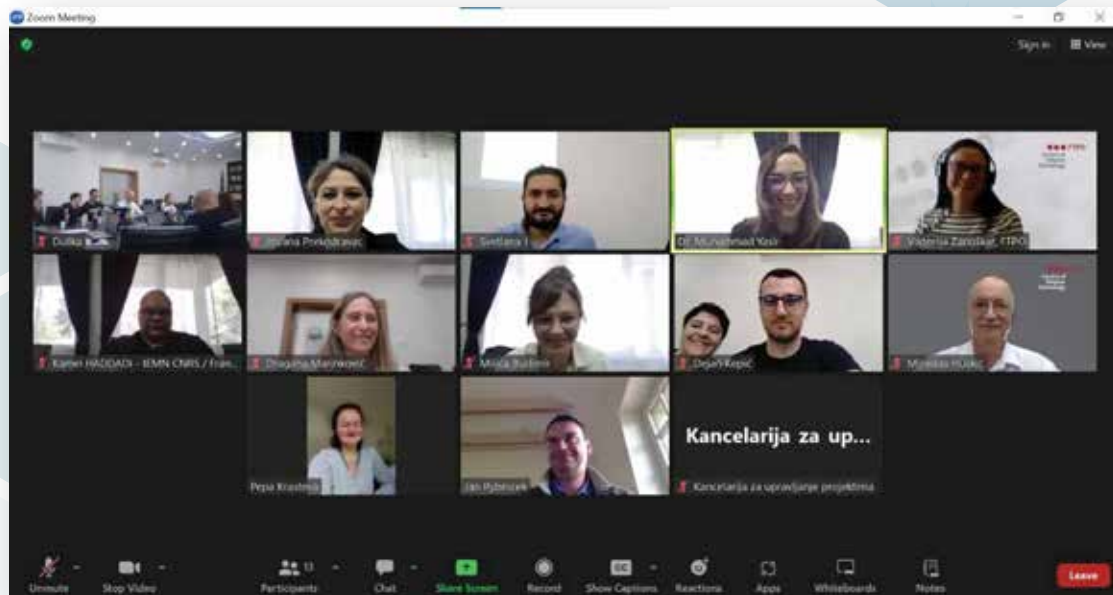
Within months of preparation and more than a year and a half of work put into achieving **GrInShield** goals, the midterm review meeting on April 5<sup>th</sup>, 2024 was a pleasant experience!

Thanks to the enthusiasm and devotion of CNRS team leader Dr. Kamel Haddadi, UniOldenburg leader Dr. Muhammad Yasir, and FTPO leader Dr. Miroslav Huskić, our team demonstrated the full potential of various specialities combined into unique ideas and vitality of the role of each member of the team.

WP leaders (Dr. Svetlana Jovanović, Dr. Dejan Kepić, Dr. Jovana Prekodravac, Dr. Milica Budimir, and Dr. Duska Kleut) impressively presented their actions since **GrInShield** began, showcasing commitment to action and achievement of all scheduled activities.



**GrInShield** team thanks to our amazing POs for their generous help and prompt answers! Finally, we are thankful to our external expert for his kind words and advice for the future! Thank you all for your effort in **GrInShield** implementation, **GrInShield** PI Svetlana Jovanović.



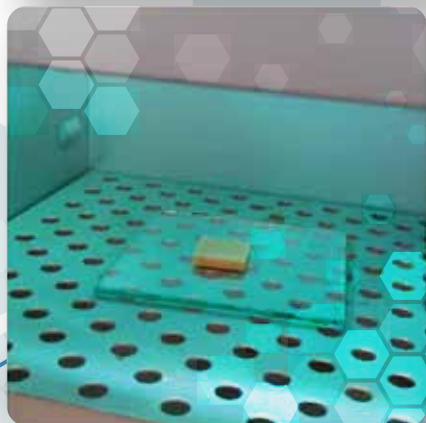


## Semester at FTPO

PhD students from VINCA Mila Milenković and Brankica Gajić became FTPO students for one semester. There is no better place to study polymer processing, characterization, and 3D printing than in an EU-leading institution for polymer synthesis, technology, and processing. Our youngest members, Mila and Brankica are getting both practical and theoretical knowledge and hands-on training thanks to our partner and host Assoc. Prof. Dr. Huskić, Assoc. Prof. and Dr. Nardin, dean of FTPO.

During the first month, they were given extensive practical training on the preparation of the resins for UV polymerisation and work on digital light processing (DLP) 3D printer. They also worked on Thermogravimetric analyser (TGA) and dynamic mechanical analyser (DMA).

Besides, they followed lectures about polymer processing, polymer nanocomposites and characterisation.



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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 where you can find all the relevant data about the project.

