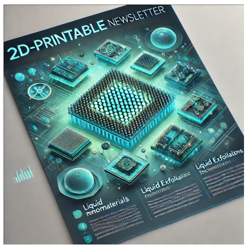
NEWSLETTER #4 - November 2025

Dear reader,

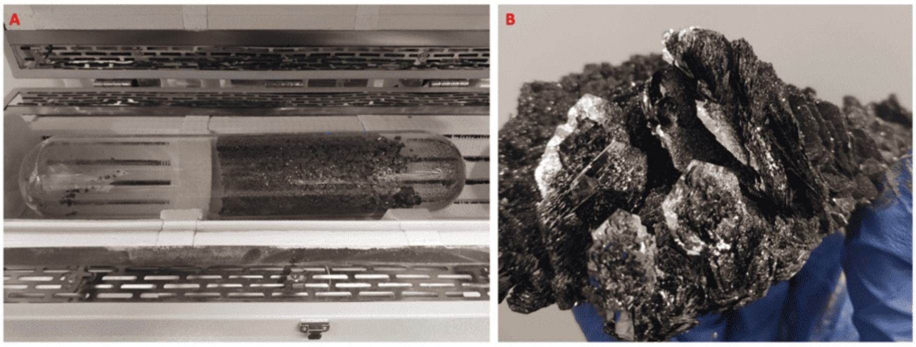


We are thrilled to bring you the fourth edition of the 2D-PRINTABLE newsletter! In this issue, you will find the latest updates on our project milestones and results, exclusive interviews with our partners, and information on where to meet 2D-PRINTABLE at upcoming events. We also highlight key moments from the past months, including our active presence at Graphene Week.
Follow us on LinkedIn and subscribe to our newsletter to stay informed on all our progress and upcoming events.

Progress update and latest project achievements

Synthesis of bulk materials

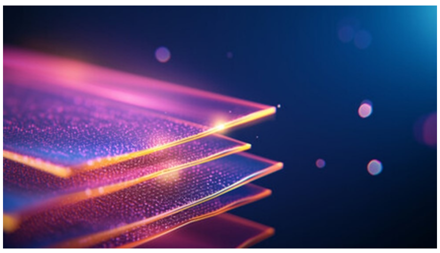
A comprehensive library of 2D materials for ink fabrication has been successfully established, covering a broad range of material classes, including p-type and n-type semiconductors, metals, insulators, and functional materials such as ferroelectrics, multiferroics, superconductors, and magnetic 2D compounds. The established 2D material library provides a strong foundation for subsequent activities, including exfoliation, ink formulation, and device fabrication, thereby supporting further research and technological development. Read more on our website here.



Advancing Vertical Heterostacks with Solution-Processed 2D Nanosheets

2D-PRINTABLE presents optimised fabrication strategies, demonstrated through metal-insulator-metal (MIM) capacitors and metal-semiconductor-semiconductor-semiconductor-metal (MSSSM) LEDs. Electrochemically exfoliated MoS_2 nanosheets were employed as a model material, with film thickness tunable simply by adjusting the number of coating cycles. The full report is available on our website.

Cross-linking forming networks and heterostructures



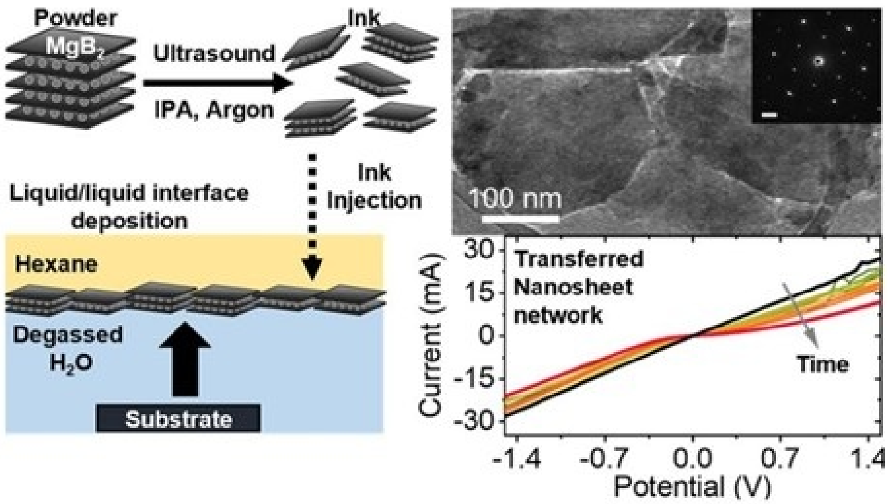
Our project partners demonstrated the fabrication of cross-linked networks based on defect-engineering. The synthesized cross-linked hetero-networks have been further characterized, shedding light on the unique optical characteristics of covalently interconnected networks, such as the suppression of the formation of typical tightly bound interlayer excitons of conventional TMD blends, which promotes faster charge separation.

Functionalisation of 2D materials

Novel chemical functionalisation strategies have been explored for two distinct classes of materials: layered compounds (CrSBr, $Bi_2Se_2O_5$, VOCl, and PrOCl) and metal diborides (MgB_2, ZrB_2, and CrB_2). For layered compounds, the focus was on non-covalent functionalisation using a range of surfactants. This type of functionalisation enables the modification of material surfaces without altering their intrinsic structure, allowing for the tuning of properties such as optical characteristics through dielectric interactions.

[Characterisation of new materials]

2D-PRINTABLE partners studied exfoliation of layered materials (TaS_2, Bi_2SeO_5, CrSBr, $Na_2Cu_2TeO_6$) that have not been previously studied using Liquid Phase Exfoliation (LPE). To assess whether structural integrity of the nanosheets is preserved after exfoliation and to identify nanosheet size, thickness and morphology, a range of spectroscopic and microscopic techniques was employed (XRD, TEM, SAED, SEM, EDX, AFM), also providing important information for further processing. Read the full report on our website.



[All nanosheet thin film transistors (TFTs)]

A significant challenge in printing inks containing nanosheets with low aspect ratios is that such networks tend to be highly porous and disordered. As a result, the junctions between nanosheets, which are a key factor limiting the mobility and conductivity of the network, often form point-like structures with exceptionally high junction resistances. In 2D-PRINTABLE, the developed transition metal dichalcogenides (TMDs) were successfully integrated into flexible devices. More information and the full report can be found on our website.

2D-PRINTABLE events

Graphene Week 2025

Our 2D-PRINTABLE partners (BeD, VSCHT, TUD, UKa) attended Graphene Week in Vicenza, Italy (22–26 September 2025) and showcased their research developments through a series of talks and poster presentations. The event provided an excellent opportunity to present our project at the booth, give an overview of our upcoming research activities at the Graphene Flagship Annual Meeting, connect with other projects, exchange ideas, and discuss the future of 2D materials.

Check out our LinkedIn page and the Graphene Flagship LinkedIn for more highlights from the event!

Mark Your Calendars: Graphene Week 2026!

We're excited to announce that the next edition of Graphene Week will be hosted in the beautiful city of Porto, Portugal, from 21–25 September 2026.

2D-PRINTABLE General Assembly and Advisory Board Meeting in Strasbourg

The 2D-PRINTABLE consortium gathered in Strasbourg, France for its 4th General Assembly and the first Advisory

Board (AB) meeting, hosted by our partner UNISTRA. Discussions during the meeting spanned the full research spectrum: theory-driven identification of novel 2D materials, synthesis of layered crystals, exfoliation and functionalization, material characterization, and device development. Our Advisory Board is formed by three outstanding external experts: **Prof. Klaus Müllen** – Former Director and Scientific Member (1989–2016), Max Planck Institute for Polymer Research, Germany, **Prof. Sir Richard H. Friend** – Cavendish Professor of Physics, University of Cambridge, UK, **Dr. Fabian Streb** – Head of the Materials Innovation Group, Infineon Technologies AG, Germany. With the feedback from Advisory Board, we will refine the next steps and continue building strong collaboration within the consortium and the broader research community.

9th EU-Korea workshop and E-MRS Spring Meeting 2025

On 26 May 2025, the University of Strasbourg (UNISTRA) hosted the 9th EU-Korea Workshop on Graphene and 2D Materials at the Institute for Supramolecular Science and Engineering, gathering researchers and innovators from Europe and Korea to explore the latest advancements in graphene and related materials. The workshop was co-chaired by Professor Paolo Samorì (France), and Professor Sang Ouk Kim (Republic of Korea), and organised by 2D-PRINTABLE.
The event also featured contributions from 2D-PRINTABLE sibling projects under the Graphene Flagship: GRAPHERGIA, ARMS, GIANCE and 2DNeuralVision.

Following the EU-Korea workshop, Strasbourg also hosted the 2025 Spring Meeting of the European Materials Research Society (E-MRS) on 27 and 28 May 2025. The brought together researchers from both academia and industry. Several early-career scientists received recognition for their outstanding contributions. Within 2D-PRINTABLE, Timm Knickrehm from the University of Kassel (UKa) was awarded a poster prize for his work on optimizing the electrochemical exfoliation of MoS_2 films, Anna Zhuravlova from UNISTRA received a poster award for her work on intra-flake and inter-flake charge transport in 2D MoS_2 networks, while Martin Gerlei from the University of the Bundeswehr Munich (UniBwM) was honoured with the Young Researcher Award.

New 2D-PRINTABLE publications

The 2D-PRINTABLE project has reached an exciting milestone – 40 scientific publications already released! Dive into our Publications section to explore them all, and don't miss our highlights from selected papers.

Get to know 2D-PRINTABLE Team

In this edition, we introduce two of our 2D-PRINTABLE partners:

Georg Duesberg - Since 2017 Prof. Duesberg has been a Chair for Sensor technologies at the Institute of Physics and is spokesman of the Centre for Integrated Sensors (SENS) at the UniBw M. His research focuses on the synthesis, characterization, and device fabrication of low-dimensional materials. In recent years, his work has concentrated particularly on two-dimensional transition metal dichalcogenides (TMDs), with a special emphasis on $PtSe_2$.

Kevin Synnatschke – Dr. Synnatschke is a group leader in Prof. Xinliang Feng's group at TUD. The research of Kevin spans exfoliation, ink formulation and thin-film processing for functional 2D nanomaterials.

Explore these exciting interviews on our website.

Meet us at thes upcoming events

In the coming months the 2D-PRINTABLE partners will present the latest project updates and engage with the broader scientific community at:

- **MRS Fall Meeting & Exhibit** – Boston, USA | *30 November – 5 December 2025*
- **Workshop on 2D Materials and Interfaces of Tomorrow: Synthesis & Characterisation** – Grenoble, France | *10–11 December 2025*

SAVE THE DATE!
March 31st, 2026 | Dublin, Ireland

2D-PRINTABLE Symposium: "2D Printed Materials On-Demand for Digital Electronics"

Join us in Dublin for a one-day symposium exploring the future of 2D printed materials and digital electronics. The event will be co-organised by 2D-PRINTABLE and HYPERSONIC, featuring invited speakers from the Graphene Flagship projects – SAFARI and ARMS, as well as presentations from our partners highlighting the latest project achievements and breakthroughs.
The day will conclude with an evening panel discussion on Policy and Industry Perspectives, bringing together leaders from research, innovation, and industry.

Save the date and join us in shaping the future of 2D printable technologies!

Project Partners

2D-PRINTABLE joins a multi-disciplinary consortium with 7 Universities and 2 SMEs, located in 7 European countries including Ireland, France, Italy, Germany, Czechia, Switzerland and the Netherlands, to advance the field of 2D materials and unlock the full technology's potential to play a significant role in the future of European digital electronics manufacturing.

Trinity College Dublin
Université de Strasbourg
UNIKASSEL VERSITÄT
BEDIMENSIONAL
TECHNISCHE UNIVERSITÄT DRESDEN
VYSOKÁ ŠKOLA CHEMICKO-TECHNOLOGICKÁ V PRAZE
UNIRESEARCH
UniBw M
EPFL

Facts & Figures

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Duration: 36 months
Start date: 1st October 2023
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