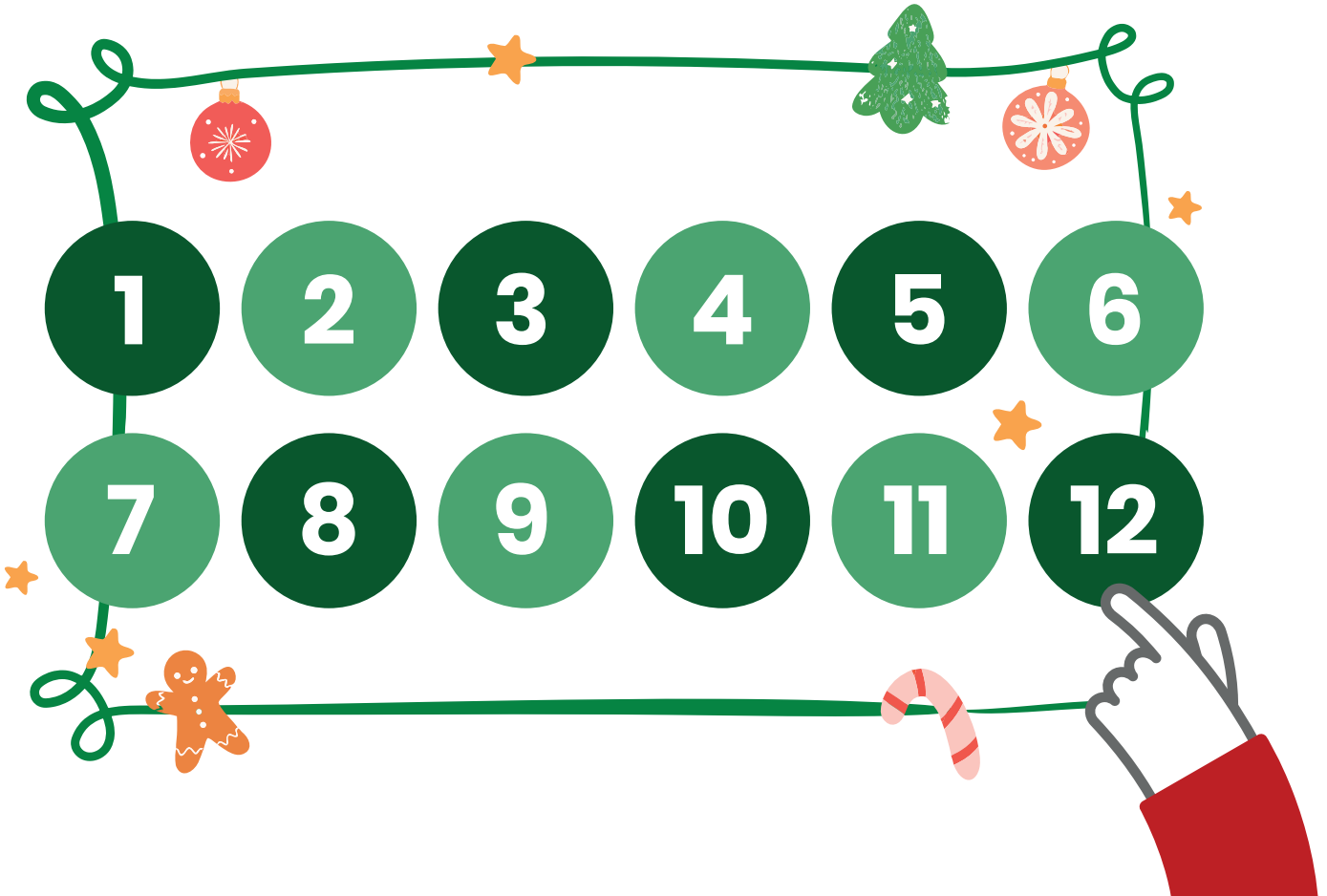
SUPREME

SUstainable nanoPaRticles Enabled antiMicrobial surfacE coatings

The SUPREME Coating Advent Calendar – 12 Highlights of 2025

Intro Section

It's been a year of innovation, collaboration and breakthroughs for the SUPREME project! As we wrap up 2025, let's open twelve little windows — each revealing a moment we're proud of and a glimpse of what's next.



KEYNOTE MESSAGE – FROM JAN F.M. VAN IMPE, PROJECT COORDINATOR (KUL)

As 2025 comes to a close, we reflect with pride on the SUPREME consortium's significant progress in developing sustainable, high-performance antimicrobial nanocoatings. The collective expertise, commitment and collaboration have driven meaningful advances toward safer public environments. We look ahead with anticipation to 2026, the project's final year, confident that together the consortium will build on this momentum and translate our innovations into validated, scalable technologies and materials. Together, we are ready to deliver meaningful impact!

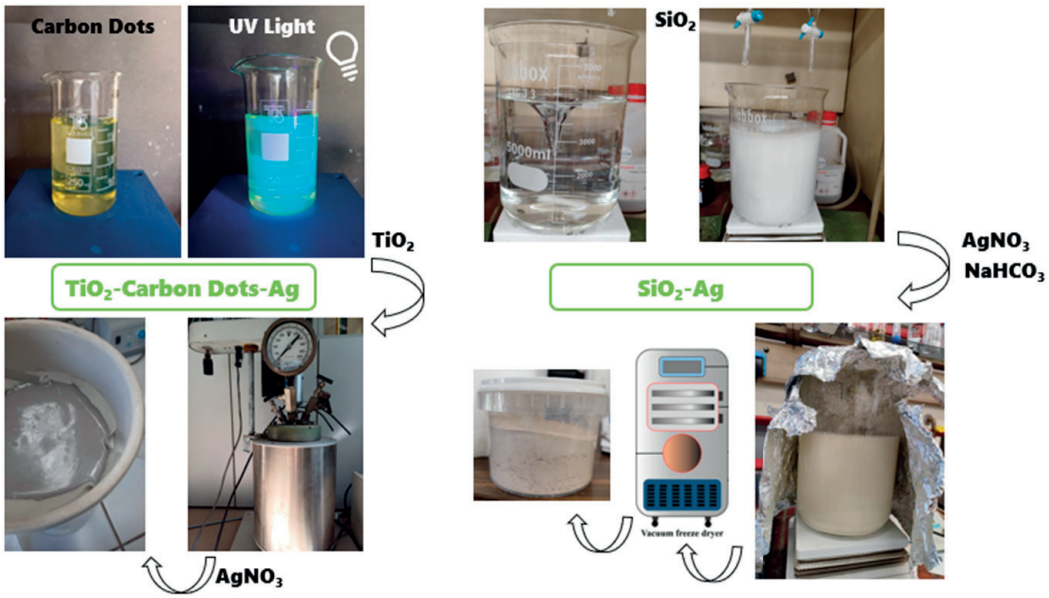
The 12 Windows of SUPREME Advent Calendar

1 The SUPREME Family

Every time the SUPREME partners meet, we strengthen the bonds that make our project more than just research. These moments of connection remind us that behind every breakthrough are people, ideas and friendships growing stronger with each milestone - the true coating that holds the SUPREME project together!

We fondly look back on our meeting in Bilbao last June, a moment of shared progress, collaboration and inspiration.

2 Science in Action



In 2025, SUPREME's partner NTUA carefully selected the brightest stars of their lab, the materials with the best photocatalytic and antimicrobial properties for upscale synthesis. They gave the core materials (TiO2 and SiO2) a festive makeover, decorating them with glowing Carbon Dots under UV light and sparkling Ag nanoparticles. These TiO2-Carbon Dots-Ag and SiO2-Ag core-shell materials became the true shining stars of SUPREME research, ready to be applied as antiviral, antibacterial and antifungal coatings.

3 Collaboration Stories

In SUPREME, partners CRF and PCN joined forces to explore applications of new materials in the automotive sector. Thanks to this collaboration, several opportunities were identified, from plastic parts and metallic components to soft trims. PCN materials were sent to CRF and characterized for process compatibility and absorption performance. The joint effort delivered promising results, and their potential integration into the Stellantis value chain is now under discussion.

4 Faces of SUPREME

In every edition, we introduce some of the Faces of SUPREME! This holiday season, meet Filipa Tomé, Country Manager at PNO Innovation Portugal and one of the driving forces behind the project's communication and dissemination activities:

"Being part of the SUPREME project means giving innovation a voice that inspires! At PNO Innovation Portugal, we support the project's communication, dissemination and exploitation activities, turning complex research into stories that connect people, ideas and impact. With creativity and collaboration at heart, we celebrate a year of remarkable progress and look forward to continuing this journey in 2026, as we focus on maximising the visibility and exploitation of SUPREME's results!".

5 Sustainability

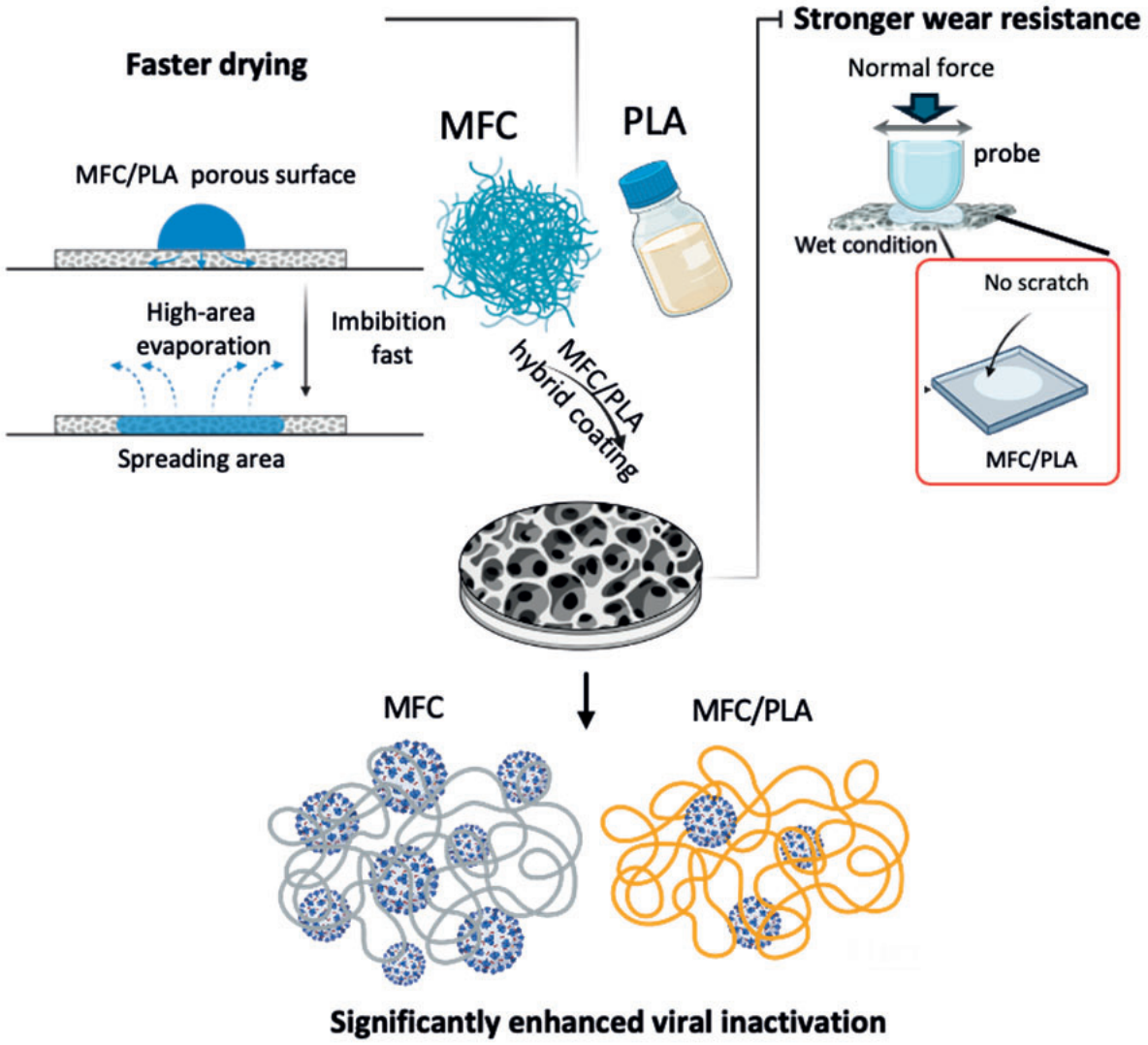
This year, SUPREME's partner Tecnalia has been diving deep into the environmental performance of advanced nanomaterials, exploring how to make their journey from lab to industrial application as sustainable as possible. Using Life Cycle Assessment (LCA), they analysed TiO_2 nanoparticles, core-shell particles and CQDs-based TiO_2. Electricity use proved to be the key impact driver (69–97%), mainly from drying, calcination and reactor operations. By optimising these steps and switching to renewable energy, impacts could drop by up to 90%. Applying eco-design, eight strategic areas were identified to enhance sustainability, proving innovation and responsibility can go hand in hand!

6 Events

(Photo credits to SSbD4CheM)

Throughout 2025, the SUPREME project took part in several key events and dissemination activities, sharing its vision of sustainable antimicrobial coatings. One highlight was our participation in the 13th Venice Training School 2025, a collaborative initiative dedicated to Safe-and-Sustainable-by-Design strategies for advanced materials. SUPREME proudly contributed to this inspiring event, joining fellow EU-funded projects to exchange insights, foster collaboration and promote responsible innovation! Teaching materials and recordings have been made freely available by SSbD4CheM in YouTube and Zenodo.

7 Innovation Highlight



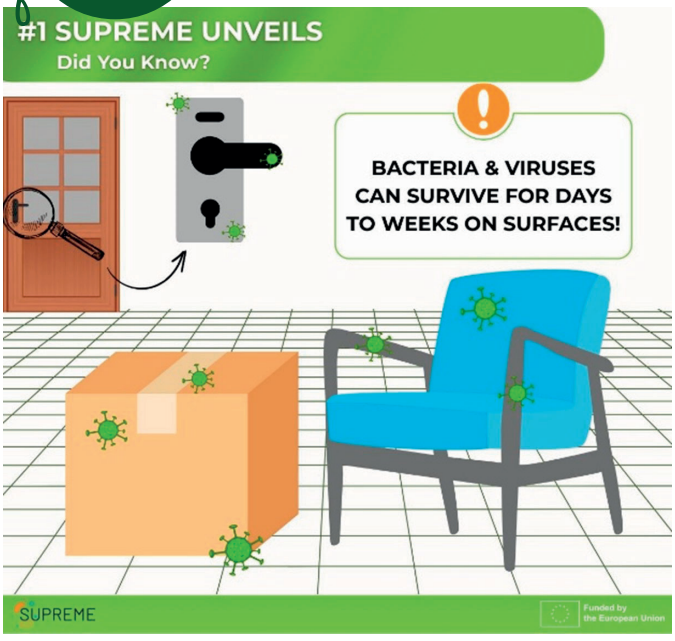
This year, our partner University of Birmingham achieved a remarkable milestone within SUPREME by developing a stable, high-performance MFC/PLA hybrid coating. The new formulation dries faster, resists wear even in wet conditions and shows significantly improved viral inactivation compared with neat MFC. A small adjustment in the recipe led to a major boost in performance, paving the way for the next step: incorporating antimicrobial nanoparticles to further enhance protection and functionality!

8 Young Researcher's Voice

In SUPREME, young voices bring fresh energy and curiosity to every experiment, reminding us that innovation grows where new perspectives and teamwork meet!

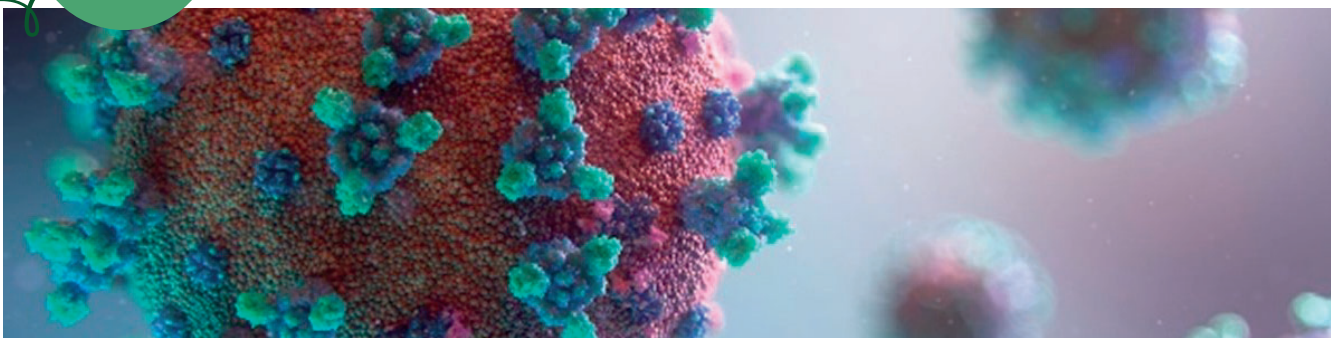
"Working on SUPREME opened a whole new world for me. From exploring how nanoparticle synthesis shapes their antifungal abilities to discovering how differently fungi, bacteria and viruses respond to them. It taught me patience, communication and the joy of collaborating in a multicultural team. Seeing how these materials could one day protect real people keeps me motivated every day."
Foteini Gerodimou, NKUA PhD candidate

9 Communicating Science



This year, SUPREME launched a new communication series on LinkedIn — SUPREME Unveils — created to share fun facts, surprising insights and science-based information about antimicrobial coatings, nanomaterials and sustainability. Each post helps raise awareness about how our research contributes to safer public spaces, workplaces and healthcare environments. Follow our LinkedIn to discover how SUPREME turns complex science into engaging stories for everyone!

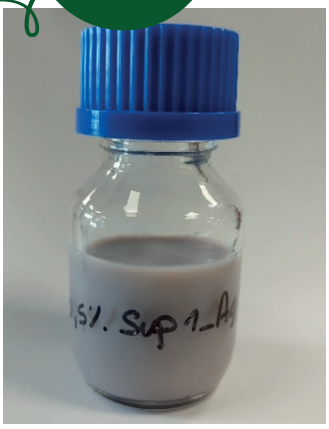
10 Market Potential



Back in 2022, when the SUPREME proposal was submitted, COVID-19 was still a major global threat and one of humanity's greatest challenges. It was a moment that reminded us how crucial it is to protect people in shared spaces. According to our partner ORYKTON, SUPREME's goal to limit the spread of microbes, viruses and fungi in high-traffic environments through advanced nanocoatings felt deeply meaningful then and continues to inspire us and be relevant today.

With a targeted market size of USD 13.29 billion in 2024 and a projected CAGR of 12.8% through 2034, we believe SUPREME's solutions have real potential to make a lasting difference in hospitals, care homes, restaurants, schools and beyond. What began as a response to a crisis has become a shared commitment to safer, cleaner and more sustainable spaces for everyone!

11 Looking Ahead



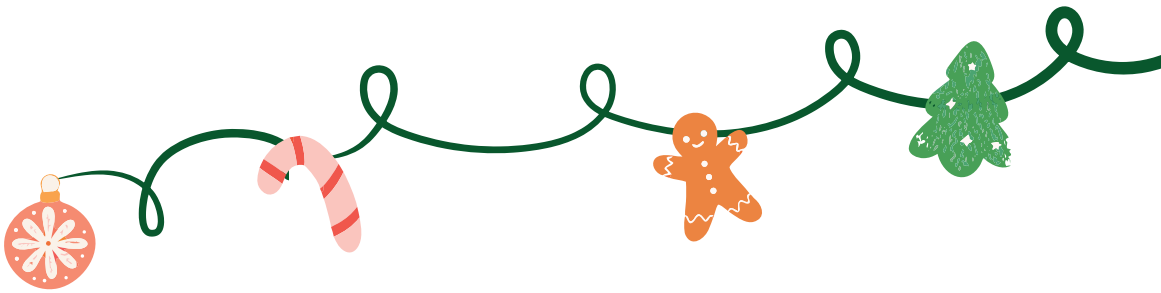
Our partner NTT shares that after a year of strong progress in antimicrobial treatments for textile substrates, 2026 will focus on implementing and validating the durability of antimicrobial coatings applied to cotton using conventional dyeing processes. This phase will include targeted textile testing to assess performance, and, if needed, the evaluation of additional additives to further enhance effectiveness. These demonstration milestones will move SUPREME's coatings one step closer to real-world application.

12 Season's Greetings from SUPREME

The SUPREME consortium wishes you all a joyful holiday season, filled with warmth, new ideas, and the spirit of innovation that drives us forward into 2026!

THANK YOU FOR FOLLOWING OUR JOURNEY!

As this special December edition closes, we want to thank everyone who has followed and supported SUPREME Coating throughout 2025, from our project partners to the broader research and industry community. The year ahead will bring exciting demonstrations, new results and the final step toward impact. Stay tuned for updates, events, and more stories from our journey toward safer, more sustainable coatings.



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