



## Newsletter #2

# Editorial

Dear reader,

2024 is not over yet but it's already been a very busy year for TITANS: studies have considerably progressed, with first publications submitted and presentations in conferences on the rise. These opportunities have provided fruitful exchanges between consortium members and colleagues from different scientific communities, and a little bit of spotlight as well with the SOFT poster prize attributed to Guillermo de la Cuerda Velazquez (UPM & CIEMAT) for his work on SiC coatings performances.

No project goes without a few twist and turns, but thanks to the commitment of the consortium, no significant delay is to be expected as was evidenced during the 3<sup>rd</sup> plenary meeting settled in Madrid from Oct 9 to 11. The discussion, with the insightful perspective provided by SAC members, highlighted that dust issues are key for both fusion and fission considerations and a trans disciplinary link and concern. In the current evolution of tritium thematics following private interest diversifying the fusion scene, our commitment to providing innovative solutions to allow future tritium uses and define safe methods and protocols is getting more and more attention: we had the honor to be invited to present at the OECD Science meeting, and exchange with European public and private partners at the Spanish embassy in Dublin in parallel to the SOFT conference. The 3<sup>rd</sup> Tritium school benefited from an unprecedented attendance from a large international audience, and considerably increased the project recognition (on that subject, the warmest welcome to newsletter subscribers who joined the mailing list following their participation!). On a more focused theme, the 2<sup>nd</sup> workshop on Tritium Transport Modelling in Nuclear Fission and Fusion took place on Oct. 8 in Madrid to allow training and discussions regarding the various tools used and their respective capabilities. Last but not least, the in-depth reference hydrogenated particle study is moving on to the much-awaited tritiated genotoxic

effects on human macrophages after tritium particles exposure was finalized, and we are excited to compare hydrogenated and tritiated results!

As we're entering the final year of the project, we are focusing our efforts on finalizing the scientific work, but also exposing it to a large audience, in particular to all potential stakeholders. Share and discuss knowledge acquired is a priority for the projects involving tritium, as it defines what still needs to be done with the best perspective and priority order. Handle, control and protect: the motto defining the 3 scientific work-packages of the project keeps defining the needs of both fusion and fission future applications, and we are looking forward to adding our contribution!

Elodie Bernard,  
TiTANS Project Coordinator



Figure: Group photo of the on-site participants.

## Third Tritium School

The Third Tritium School was held in hybrid mode in Marseille, France and online, from 18<sup>th</sup> to 22<sup>th</sup> March 2024. The event website is available at the link [here](#). The Third Tritium School is a continuation of the successful [First and Second Tritium Schools](#), which were organized within the TRANSAT project ([TRANSversal Actions for Tritium](#)) and received great appreciation from the community.

The school consisted of four days of tutorial lectures, while a visit to the ITER site was be organized on the fifth day. Experts in the field of fusion, fission, waste management, biology applied to toxicology and dosimetry from all over the world gave lectures on various topics related to tritium. The topics addressed were highly multidisciplinary and range from tritium detection, management, control, retention and waste to radiotoxicity, ecotoxicity and dosimetry of tritium in organisms.

The first Tritium School was a success and we believe we have with the Second Tritium school exceeded our expectation for participation which means the school got good reputation on the quality. The third tritium school exceeded the second edition which we believe is a really great success. The hybrid format elevated the event and significantly expanded its reach. The expected impacts were very much achieved at the Third Tritium School being a great success and having 469 participants from around the world. The profile of the participants was students, engineers, scientist and senior scientist. The reason for attracting also experienced researchers shows us that the topics related to tritium are actual (due to use of tritium as fuel in future fusion devices), important and very much interdisciplinary. Namely, in order to get a good overview over the subject one needs to understand the basic physics how tritium is produced, where it is used and how it could be detected

and handled as a waste material and most importantly how it could influence on organisms and environment. This is what the school program provided by gathering scientists and senior scientists to look at the tritium problem from different aspects and to give knowledge to the future generations.



## SOFT POSTER PRIZE Winner

The 33rd Symposium on Fusion Technology (SOFT) took place from 23<sup>rd</sup> to 27<sup>th</sup> October 2024 in Dublin, Ireland. Guillermo de la Cuerda Velázquez, PhD student that forms part of TITANS project participated in it, with his work on the "Performance of amorphous SiC (a-SiC) coatings under thermal cycling, annealing and PbLi exposure". In this work, the behavior of a SiC coatings deposited by RF sputtering submitted to thermal cycling and PbLi exposure was studied. To do this, a morphological, elemental, microstructural and adhesion analysis using a variety of techniques (SEM EDX, NRA+EBS, XRD, nanoscratch) was performed that provide important insight on the response of these coatings to the conditions expected in the WCLL (Water Cooled Liquid LiPb). This study is the first one to demonstrate the compatibility of a-SiC coatings with PbLi at 450°C, providing important information on the Li diffusion into the samples depending on the deposition conditions. For it, Guillermo received the 1st place in the PhD poster prize competition.

The insights provided by this work will be key in developing a-SiC coatings with very high anti-permeation properties. Experiments are underway to assess their performance as permeation and corrosion barriers, including Tritium permeation and atomic Deuterium exposure

[Check out the Event!](#)



## **2nd Workshop on Tritium Transport Modelling in Nuclear Fission and Fusion**

On October 8th, under the framework of the TITANS project, the *2nd Workshop on Tritium Transport Modelling in Nuclear Fission and Fusion* was held at CIEMAT. The workshop provided a comprehensive exploration of the state-of-the-art in tritium transport codes for both nuclear fusion and fission systems, integrating theoretical modelling, experimental validation, and practical applications. It began with a welcome address by David Rapisarda (CIEMAT), head of the Nuclear Fusion Technology division of CIEMAT, followed by an introduction from Carlos Moreno (TITANS), who outlined the workshop's objectives and set the stage for the discussions to come.

The morning sessions delved into key aspects of tritium dynamics and transport. Fernando R. Ugorri (CIEMAT) opened the technical presentations with an insightful discussion on the multi-isotopic effects on trapping. Luigi Candido (Kyoto Fusioneering) followed with a detailed presentation on Kyoto Fusioneering's tritium-focused research, highlighting advancements in the SCYLLA breeding blanket and the UNITY-2 fuel cycle test facility. This was complemented by Almudena Rueda and Jenifer Serna (EAI), who presented a tritium transport model developed in EcosimPro for the WCLL-TBM system, demonstrating the model's potential for addressing design challenges.

Thierry Gilardi (CEA) expanded on the topic of hydrogen and tritium transfers in Sodium Fast Reactors, adding another layer to the discussion on isotope management in a fission reactor. Gabriele Ferrero (Polito) and Carlos Moreno (CIEMAT) then focused on the critical processes of verifying and validating tritium transport codes, emphasizing their importance for benchmarking and ensuring accuracy at the component level.

After the lunch break, the afternoon sessions continued with Alexia Onieva (EAI), who analysed tritium permeation in radioactive gas systems, offering insights into mitigating permeation challenges. Sebastian Hendricks (CIEMAT) presented simulations of hydrogen isotope thermal desorption from yttrium, exploring innovative approaches to recover used hydrogen traps in IFMIF-DONES. Etienne Hodille (CEA) took the discussion further with a presentation on multiscale modelling of hydrogen isotopes, including transport, trapping, and desorption in plasma-facing materials, offering a detailed view of the interactions at various scales.

The latter part of the day included updates on advanced modelling tools. R. Delaporte-Mathurin (MIT) provided an overview of FESTIM's status and development as an open-source tool for hydrogen transport modelling. Yonghee Lee (KFE) introduced the THETA-FR platform, demonstrating its capabilities for tritium transport analysis in blanket systems.

The workshop concluded with a collective discussion among all participants, addressing current challenges in tritium research and identifying future directions. This collaborative exchange highlighted the importance of integrating diverse approaches to overcome existing limitations in tritium inventory prediction, handling and isotope management in fission and fusion systems.



This email was sent to {{ contact.EMAIL }} You have received this email because you have subscribed to our newsletter.

[Unsubscribe here](#)

Titans © 2024 LGI Sustainable Innovation - All Rights Reserved