



Ca' Foscari
University
of Venice
Department of
Molecular Sciences
and Nanosystems

Ph. D. student **Michele Crozzolin**
is pleased to invite you to his doctoral defense entitled
***Multifunctional radioluminescent
lanthanide-doped heavy
element-based nanoparticles***

Wednesday, July 22, 11:00 a.m.

Room Delta 0A, Scientific Campus, Mestre

Dear professors, researchers, doctoral students and colleagues, it is with pleasure that I wish to invite you to attend the defense of my doctoral thesis. I have been part of the community of the Department of Molecular Sciences and Nanosystems for many years, having had the opportunity to know you since my beginnings as a bachelor's student or more recently as a doctoral student. Having reached the end of this long and rewarding journey, I would like to share with you the results of my training and my hard scientific work: an achievement that I consider to be meaningful and which I would like to enhance with the presence of the colleagues and mentors who have contributed to shaping the scientist I am today.

This thesis investigates radioluminescence-based optical thermometry to address the lack of remote temperature sensors for extreme radiation environments. By establishing a design roadmap for X-ray activated probes, this work bridges the gap between fundamental spectroscopy and practical sensing. Initial research on bismuth silicates yielded promising sensitivity for $\text{Bi}_2\text{SiO}_5:\text{Pr}^{3+}$, while identifying $\text{Bi}_4\text{Si}_3\text{O}_{12}:\text{Pr}^{3+}$ as a near-infrared emitter. The study then explored bismuth-based fluorides, achieving the unprecedented nanodimensional synthesis of $\text{Rb}:\text{Bi}:\text{F}$ solid solutions, with BiF_3 emerging as the standout candidate due to its superior hydrolytic stability and radioluminescence yield. Finally, cerium-based fluorides CeF_3 and NaCeF_4 nanocrystals were stabilized via a refined heating-up protocol, with $\text{CeF}_3:\text{Tb}^{3+}$ demonstrating high performance and radiation hardness over the 10–300 K range. These findings provide a formalized framework and high-performance materials for real-time thermal monitoring in advanced radiation facilities and aerospace applications.