

# nanoX invited scientist

Luiz Tizei

Position Charge de Recherche

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Host lab at NanoX CEMES Team NeO and I3EM

NanoX contact Sophie Meuret and Hugo Lourenço-Martins

Dates of stay 1/11/2022 to 23/12/2022



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## Brief Biodata

Luiz Tizei has a Bachelor in Physics (2005) from the Universidade Estadual de Campinas (UNICAMP, Campinas, Brazil). In 2008, he finished his master's degree at UNICAMP. His dissertation was supervised by Prof. Daniel Ugarte and was focused on quantitative analysis of atomically resolved transmission electron microscopy images of III-V semiconductors. In 2011, he obtained his PhD from the IFGW at UNICAMP under the supervision of Prof. Daniel Ugarte and Prof. Mônica Cotta (co-advisor), with a thesis concentrated on the chemical and physical properties of III-V semiconductor nanowires. After a post-doc at the LPS-Orsay (France) and one at the AIST-Tsukuba (Japan), he joined the CNRS as a researcher in late 2014. His research is focused on the development of electron spectroscopy techniques and their application to nanooptics. Luiz Tizei received his habilitation (HDR) from Université Paris-Saclay in September 2021.

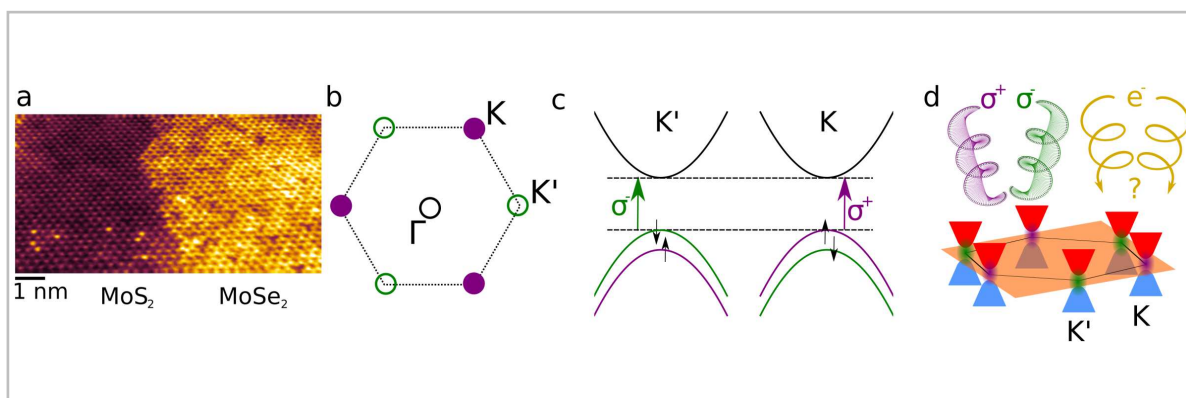
## Research project during the visit at nanoX

### Nano-optics of low dimensional materials using novel electron spectroscopies

Nanometer and atomic scale features have large impact in materials' properties, such as plasticity (dislocations), luminescence (dopants) and transport (defects), to quote only three. In addition, the actual dimensionality of the material (0D dots, 1D wires, 2D layers or 3D bulk) governs how the system actually responds. Our understanding of this response is heavily based on microscopic information, stemming from spatially resolved techniques. In this short 2 months visit to the CEMES, we will use recently developed electron spectroscopies to explore experimentally and theoretically the physics of excitons in 2D materials and the dynamics of excitations in hybrid perovskites. The two topics insert themselves into on-going projects lead by the guest researcher (L. Tizei) and are aiming at strengthening the collaboration between the LPS and the CEMES concerning nano-optics. In the near past, these two laboratories have developed complementary techniques that help us understand the physics of nano-scale systems.

The first topic will be purely theoretical, in which we will explore the possibility of exciting spin-valley states in transition metal dichalcogenides monolayers using phase shaped electron beams (Figure). In the second one, the dynamics of excitations in different materials will be explored using time-resolved cathodoluminescence spectroscopy in a transmission electron microscope.

If relevant, add a figure



a Atomically resolved image of an interface between MoSe<sub>2</sub> and MoS<sub>2</sub>. b-d in TMDs, spin-valley state can be controlled with polarized light. Can the same be achieved with phase shaped electrons?