

#ICMolTalks

**Mato Knez****CIC nanoGUNE****San Sebastian, Spain**

September 17th · 16:00 h

📍 Assembly Hall - ICMol



## Abstract

### ***Engineering with Gases: Using Vapors to Create Functional Polymer-inorganic Hybrids***

The secret of nature's success lies in its masterful integration of organic and inorganic components across multiple length scales. This talk will introduce a powerful suite of techniques under the umbrella of Atomic Layer Processing (ALP) - including Atomic Layer Deposition (ALD), Molecular Layer Deposition (MLD), and Vapor Phase Infiltration (VPI). This toolbox allows us to engineer materials with unparalleled atomic-level control, directly infusing bulk substances and surfaces with plentiful properties.

We will illustrate how we can radically enhance the mechanical strength and toughness of (bio)polymers; provide textiles and surfaces with antimicrobial properties inspired by insect cuticles; and fabricate flexible, self-repairing electronic components that mimic the resilience of biological systems. By moving from imitation to integration, we are programming multifunctionality directly into the fabric of materials themselves.

This paradigm shift, considering the scalability and precision of vapor-phase techniques, demonstrates a new era of advanced materials engineering. It paves the way for intelligent, adaptive, and high-performance solutions for applications ranging from wearable technology and soft robotics to sustainable infrastructure and biomedical devices.

## Short bio

### **Prof. Dr. Mato Knez**

CIC nanoGUNE and IKERBASQUE, Spain

Mato Knez is a professor at CIC nanoGUNE and IKERBASQUE in San Sebastián, Spain, whose career has been shaped by leading research institutions across Europe. He studied chemistry and earned his doctoral degree in natural sciences at the Max Planck Institute for Solid State Research in Stuttgart, Germany. He later joined the Max Planck Institute of Microstructure Physics in Halle, where he led a junior research group. In 2012, he moved to CIC nanoGUNE as an Ikerbasque Professor, where he continues to advance research at the interface of chemistry, materials science, and nanotechnology. He also teaches at the School of Engineering of the University of Navarra, TECNUN, and has co-founded and scientifically advises the start-up companies CTechnano and Novanano Medicals.

His research focuses on thin films and hybrid materials created or functionalized through vapor-phase processing, including ALD, CVD, molecular layer deposition (MLD), and vapor phase infiltration (VPI) - the latter pioneered by his group. His work has helped open new directions in hybrid nanomaterials and surface engineering, earning him the Nanofutur Award from the German Federal Ministry of Education and Research (BMBF) and the Gaede Prize from the German Vacuum Society. Since 2019, he has also served as an honorary professor at the University of Rijeka in Croatia.