

## Invitation to lecture series „Simulation Sciences“

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Thursday, October 23<sup>th</sup>, 2025, SWZ room 324 (C9), TU Clausthal, 2:00 pm

### **Nourou Amadou**

Visiting Guest Prof. Dr. Nourou Amadou, Department of Physic, Faculty of Sciences and Technologies (FAST), Abdou Moumouni University of Niamey, Niger

will talk about

### **Dynamic behavior of iron from compression to spall fracture: atomic-scale insights**

#### Content of the lecture:

Understanding the response of iron to dynamic loading is a major scientific issue of interest for various application fields. For example, as iron is the main constituent of the cores of the Earth and of some possibly habitable exoplanets, it is of key importance to know its state in extreme conditions of high pressures and temperatures, which are currently achievable in laboratory only via dynamic compression experiments. Closer to our daily life, iron and its alloys have been some of the most widely used metals in industry since the very beginning of manufacture, and they can be subjected to dynamic loading induced by impacts, explosions, collisions, or crash.

Physical processes governing the dynamic behavior of iron at very high strain rates are highly coupled, from elastic response, plastic deformation, polymorphic (solid-solid) transformations, to melting, damage, spall failure and fragmentation. Characterizing these processes and understanding their coupling at the atomic scale require heavy and complex experiments, usually carried out at large-scale facilities, as well as Molecular Dynamics (MD) simulations, which now give access to temporal and spatial scales comparable to those met in experiments.

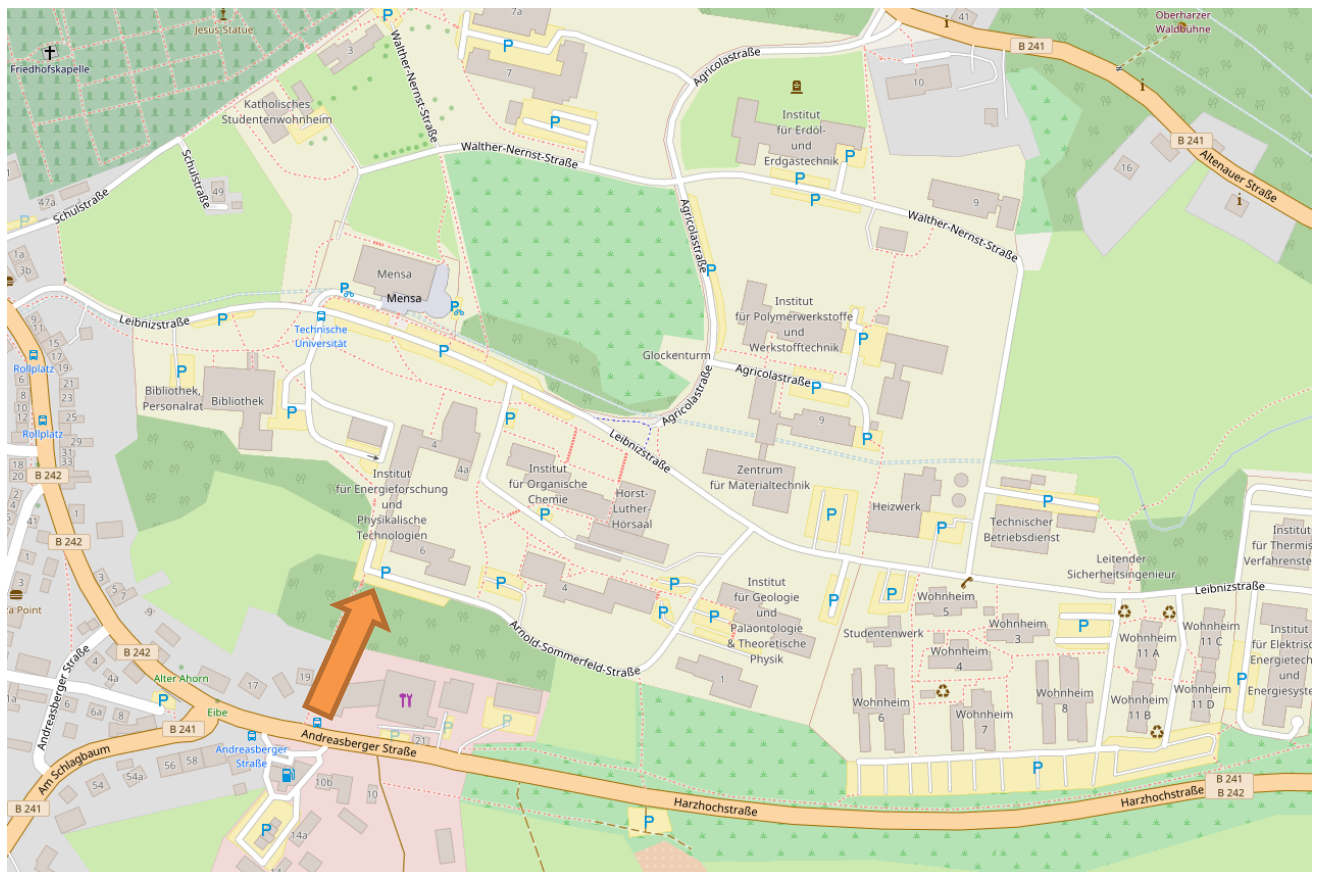
We will present our recent work where MD simulations have been used to investigate various aspects of iron samples' response to dynamic deformation from compression to spall fracture. In particular, we will discuss plasticity and phase transformations in single-crystal iron from shock compression to spall fracture; the phase transformations occurring during unloading and the spalling process due to a tensile pulse resulting from the interaction of an incident rarefaction shock wave with a reflected release wave; the coupling

between the bcc-hcp structural transformation and the mechanisms governing plasticity such as twinning and dislocation slip; the coupling between the propagation and interaction of pressure waves and the phase transformation process; and the effects of preexisting voids on the plastic deformation behavior and the kinetics of the phase transition.

**Guests are welcome.**

The lecture will be held in this building:

**Simulation Science Center Clausthal-Göttingen  
Building C9, Room 324  
Arnold-Sommerfeld-Straße 6  
38678 Clausthal-Zellerfeld**



Online participation is possible via this link:

[webconf.tu-clausthal.de/rooms/xsr-sty-qwm-a8j](https://webconf.tu-clausthal.de/rooms/xsr-sty-qwm-a8j)