# Energy Dissipation in 2D and Layered Quantum Materials

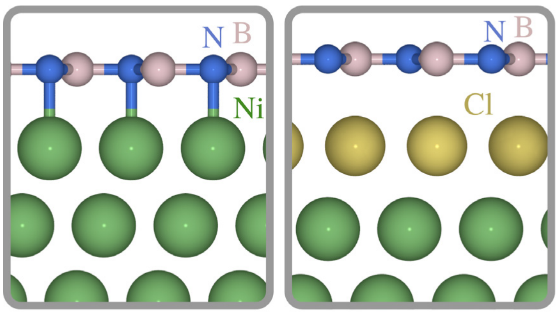
Two-dimensional and layered quantum materials have unusual thermal and electronic properties, and many of their most interesting phenomena originate at the surface or between individual layers.
When these materials are heated, driven electrically, or excited optically, they must redistribute and dissipate energy through a combination of lattice vibrations, electronic excitations, and coupling to the substrate or environment.

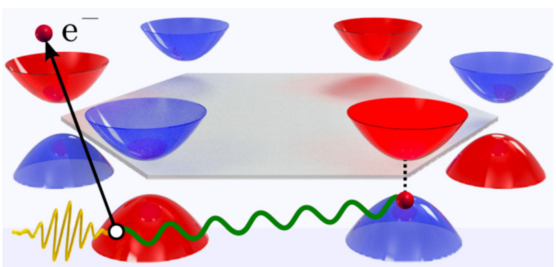
Surface structure, electron–phonon coupling, and thermal expansion are therefore central ingredients for understanding how heat and electronic energy are transported and relaxed in such systems — topics that this project will investigate at the surface of two-dimensional and layered quantum materials.

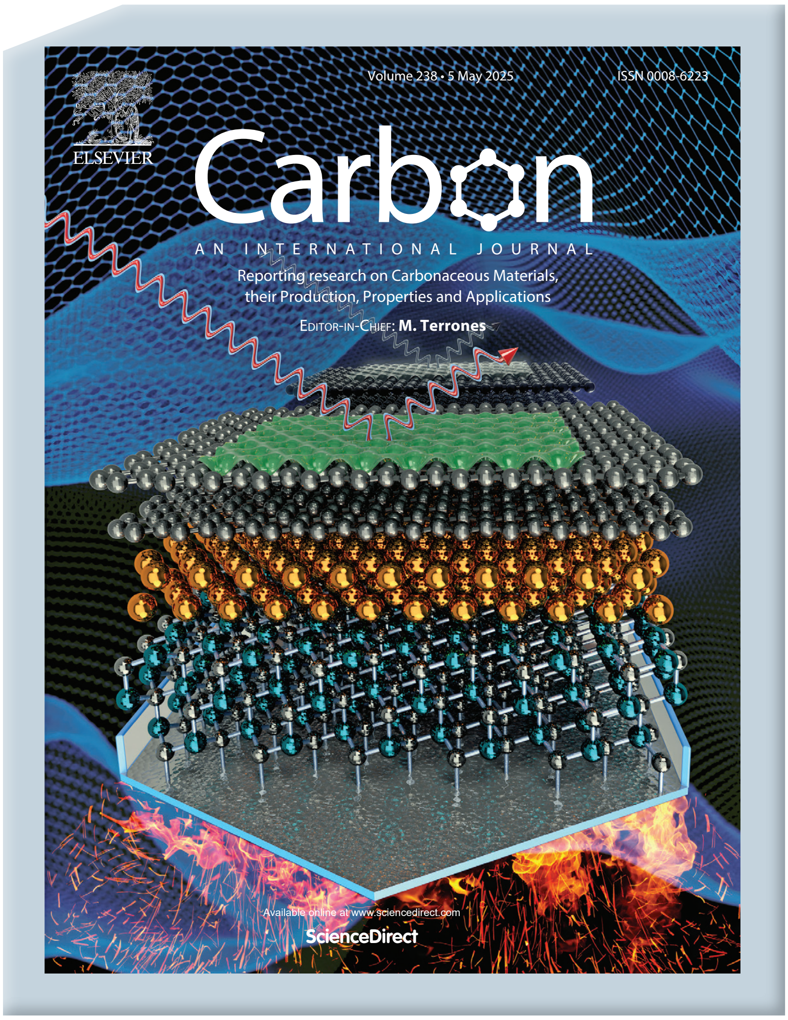
Building on our recent work on intercalated bilayer graphene (see figure below), we will investigate new materials such as intercalated hexagonal boron nitride (h-BN) and layered compounds like $NiPS_3$.

Intercalation in h-BN can weaken the interaction to the substrate, creating quasi-freestanding layers and introducing controlled doping — an ideal platform to study surface vibrational and electronic dissipation channels.

Possible directions
- surface structure and lattice dynamics of intercalated 2D materials
- electron–phonon coupling and the role of the substrate
- thermal expansion from temperature-dependent measurements




**Contact:** tamtoegl@tugraz.at