

RESEARCH

COMPUTATIONAL MATERIALS SCIENCE

- Ab - initio calculations of materials properties
- Magneto - optical properties
- Ab - initio simulation of adsorption and surface structures
- First - principles calculations of structural and electronic properties
- Investigations of magnetic properties of (ultra-)thin films and multilayers
- Gas - surface interactions
- Quantum mechanics of heterogeneous catalysis
- Graphene
- Multiferroics
- Magnetic semiconductors
- Surface magnetism

SURFACE PHYSICS

- Nanostructures at solid surfaces
- Surface structure
- Electronic structure at surfaces
- Chemical properties of surfaces, surface reactions
- Adsorption of molecules
- Surfaces of metals, oxides, and semiconductors
- Scanning tunneling microscopy and scanning force microscopy
- Low energy electron diffraction and low energy ion scattering
- Photoelectron spectroscopy
- Molecular beams
- Applications in heterogeneous catalysis, energy research, and film growth
- Thin films grown by molecular beam epitaxy and pulsed laser deposition
- Solid - liquid Interfaces



RESEARCH

SURFACE AND PLASMA TECHNOLOGY

- Plasma-assisted chemical vapor deposition
- Surface treatment by plasma at atmospheric pressure
- Extreme hardness of surfaces
- Plasma reactors
- RF and DC discharges
- Thermal and cold plasmajets
- Fundamentals and applications of surface analytical techniques
- Solid state spectroscopy with correlated electrons
- High-resolution scanning Auger electron spectroscopy
- X-ray photoelectron spectroscopy
- Numeric modeling of electron spectra

SENSORS & ULTRASONICS

- Development of sensors and measurement techniques for special applications, e.g.:
 - Medical diagnostics
 - Partial oxygen pressure in technical diving
 - Moisture content of fuels or lubricants
 - Deposit layer thickness in pipes
 - Vibration characteristics of musical instruments, strings, strings for tennis rackets
 - Predictive maintenance of hydraulic press systems
- Investigation of sound radiation and propagation
- Reduction of traffic noise or noise level of various systems (e.g., heat pumps)
- Wear investigations of tribological systems based on acoustic emission
- Development of a modular data acquisition system for analog and digital sensors



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RESEARCH at

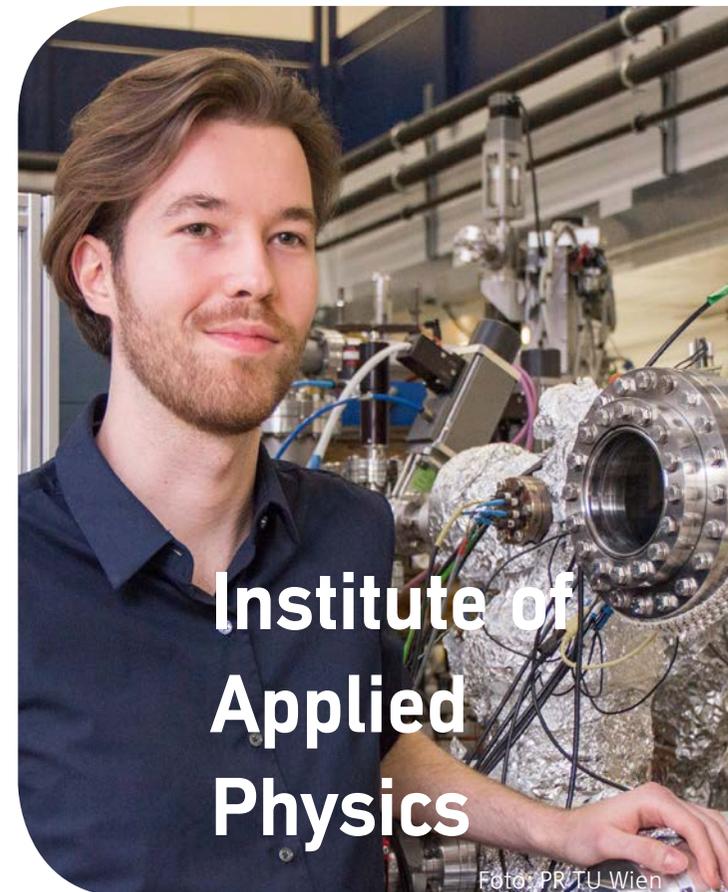


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ATOMIC & PLASMA PHYSICS

Physics of highly charged ions
Ion - surface - interaction
Atomic physics at surfaces
Ion - induced electron emission and sputtering
Ion - induced nanostructure formation at surfaces
Ion impact on graphene and other 2D materials
Atomic force microscopy
Atomic collisions in gases and in plasmas
Diagnostics of nuclear fusion plasmas
Plasma edge physics
Plasma - wall - interaction
ECR - ion sources
Laser - surface interaction
Physics with femtosecond lasers
Laser ablation
Multiphoton processes
Applications of ions and lasers in astrophysics,
nanotechnology, pharmacy and medicine

BIOPHYSICS

Single dye tracing
Single molecule spectroscopy of living cells
Microscopy beyond the diffraction limit
Nanostructur(ing) of cell membranes
Molecular interactions within cell membranes
Molecular mechanisms in T-cell activation
Artificial lipid membranes
Biochip development
Combined atomic force and fluorescence microscopy
DNA microarrays based on single molecule
spectroscopy
Supermolecular organization of proteins in cells
Applications in immunology, neurobiology, and
mycology

APPLIED INTERFACE PHYSICS

Adhesion and friction forces
Degradation and corrosion
High resolution imaging of reactive interface processes
Single molecule physics and non-equilibrium
thermodynamics
Specific recognition and molecule-surface interactions
Structure and kinetics of molecular adsorptions from
solutions
ICP-MS analysis of biologic and corroding systems
Electric double layer and hydration forces
Lipid bilayers and Langmuir-Blodgett films
Atomic force microscopy
Surface Forces Apparatus and white light
interferometry
Ionic liquid structures at interfaces
Thin films and coatings

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