TECHNOLOGY OFFER

Method for the Chemical Analysis of Objects with high Spatial Resolution

Researchers at TU Wien have developed a novel method that for the first time allows the determination of specific quantum properties of materials at electron microscopic spatial resolution. This invention has potential to revolutionise the way in which for example organic compounds, radicals, proteins, and other molecules can be studied at the atomic level.

BACKGROUND

Electron microscopy (EM) is an invasive imaging technology that is widely used to visualise the smallest structures even at sub-atomic level. It is widely used for example in medical research, life science, materials science, and nanotechnology. Spectroscopic methods, for example Electron Spin Resonance (ESR) and Nuclear Magnetic Resonance (NMR) spectroscopy, on the other hand, are non-invasive and commonly used to study the structure and properties of molecules. They have a high spectral resolution, but they typically suffer from poor spatial resolution.

TECHNOLOGY

Combining electron microscopy (EM) with spectroscopic analysis (ESR/NMR) enables the simultaneous determination of the spin properties of materials at spatial resolutions typical for electron microscopy.

TU Wien's novel technology relies on a pump-probe spin resonance spectroscopy approach, designed for EM, based on microwave pump fields and electron probes. The setup can enable observation of spin dynamics on the nanoscale, allowing for indirect measurements of the electro-magnetic environment of the examined spin systems.

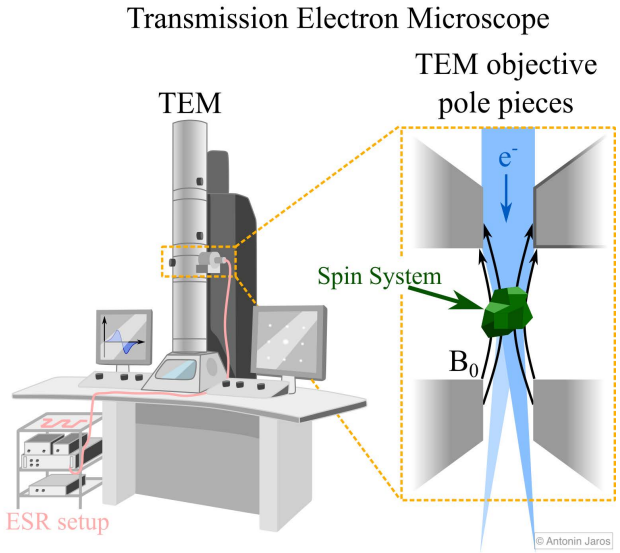

FIGURE (above)**:** Spin resonance spectroscopy with a transmission electron microscope © Antonin Jaros

BENEFITS

- High spatial and spectral resolution
- Minimised radiation damage on the samples
- The device can be constructed using standard elements

ADDITIONAL INFORMATION

- Spin Resonance Spectroscopy with an Electron Microscope, Philipp Haslinger, Stefan Nimmrichter, Dennis Rätzel, Quantum Physics [Submitted on 12 Jan 2024] https://arxiv.org/abs/2401.06496

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APPLICATION AREAS:
- Molecular analysis
- Molecular biology
- Material science
- Electronics
- Battery research

DEVELOPMENT STATUS:
- TRL 2

KEYWORDS:
- Electron microscopy
- Spectroscopy ESR/NMR
- Quantum systems
- High spatial resolution analysis
- Quantum physics
- Pump – Probe Technology
- Ultra-fast Electron Microscopy
- Quantum Electron Optics

IPR:
- AT application filed

OPTIONS:
- License agreement
- R&D collaboration

INVENTORS:
- Philipp Haslinger
- Dennis Rätzel
- Stefan Nimmricher

CONTACT:
Angelika Valenta
TU Wien
Research and Transfer Support
T: +43.1.58801.41538
E: angelika.valenta@tuwien.ac.at
www.rt.tuwien.ac.at

TU WIEN TECHNISCHE UNIVERSITÄT WIEN