

## PHELIX beamline as an advanced tool dedicated to surface science

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Phelix is one of seven research beamlines located at the National Synchrotron Radiation Center SOLARIS in Krakow. The PHELIX end station is dedicated to surface science providing various spectroscopic techniques, using an polarizing undulator as a radiation source for soft X-rays in the energy range of 50 eV to 1800 eV.

The PHELIX end station is a multi-chamber vacuum system equipped with, among others, a hemispherical Phoibos 225 energy analyzer, an advanced preparation chamber, and a station for cleaving samples. Available measurement techniques include: XPS (X-ray Photoelectron Spectroscopy), ARPES (Angle Resolved Photoelectron Spectroscopy), XAS (X-ray Absorption Spectroscopy), and XMCD (X-ray Magnetic Circular Dichroism). Regarding the needs of the user community, the beamline team intends to extend the research capabilities of the PHELIX beamline with SR-ARPES (Spin Resolved - Angle Resolved Photoelectron Spectroscopy), soon. PHELIX's end station enables the use of complementary techniques and tools both for preliminary sample characterization and in situ creation of completely new research systems (i.e Low Energy Electron Diffraction and Molecular Beam Epitaxy, by a system of various vapor sources).

The very advanced system operating in ultra-high vacuum with advantages such as tunable energy and polarization of synchrotron light allows for studying of chemical, electronic, and magnetic properties of various surface systems or interfaces. The station's spectrum of research capabilities is best reflected in user community publications, which touch upon such issues as: comparison of electronic properties in NZFO/f-MWCNTs nanocomposite systems obtained by ex-situ and in-situ synthesis [1], or explanation of the influence of the defected TiO<sub>2</sub>/perovskite interface on optoelectronic properties [2].

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### References

1. A. Bajorek et al., Journal of Magnetism and Magnetic Materials, 585 (2023) 171150.
2. C. Das et al., ACS Applied Materials and Interfaces, 15 (2023) 56500.