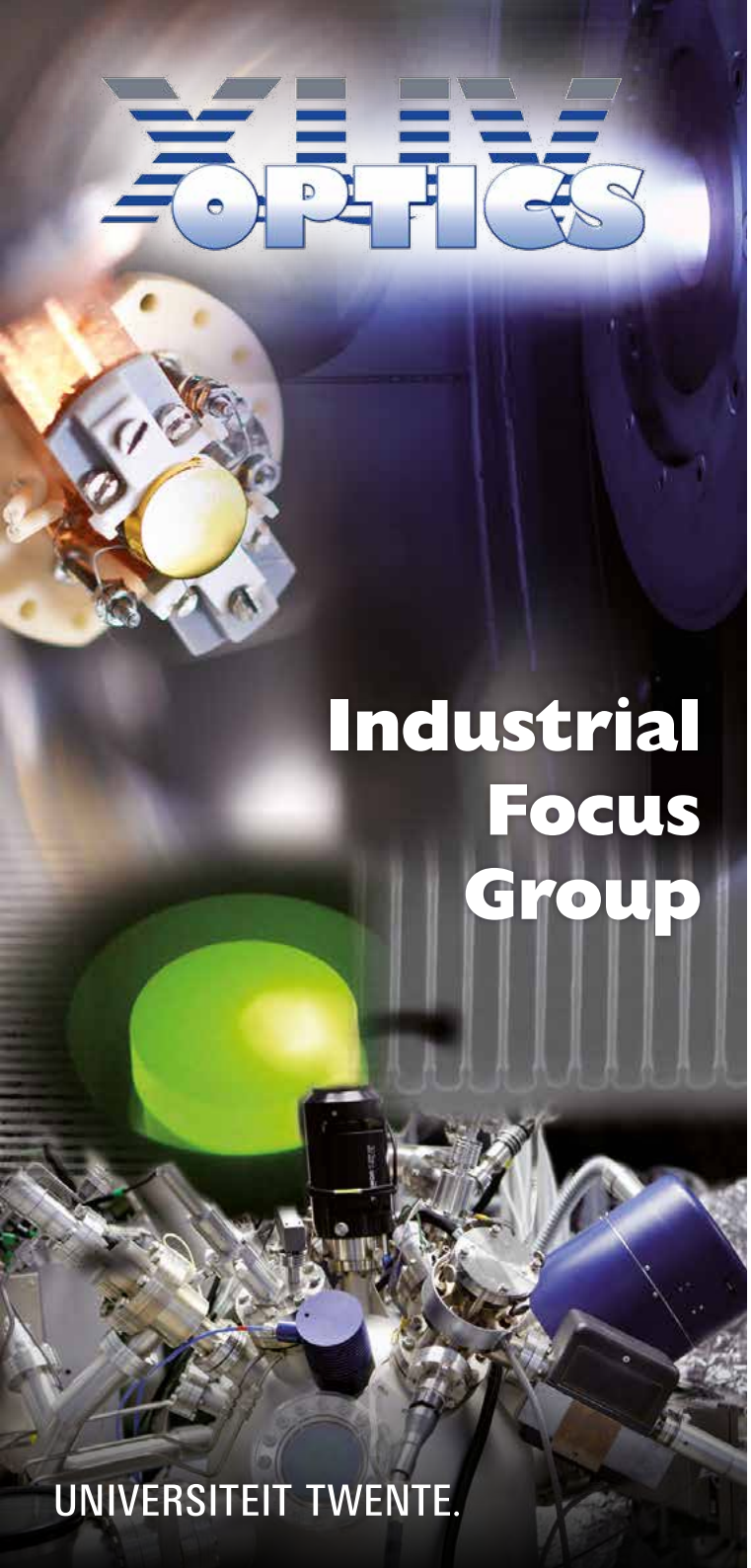
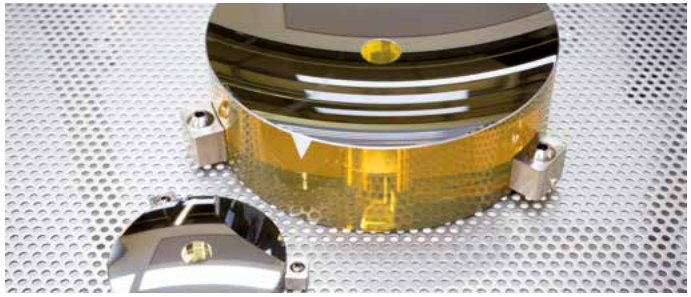


XUV OPTICS

Focusing research on XUV optics for industrial and scientific exploitation

Manipulating light in the XUV wavelength range

XUV light - light with a wavelength in the range from tenths to tens of nanometers - offers new physical insights and industrial opportunities. XUV light can trigger atomic and material processes that are otherwise unobserved, providing a new view on light-matter interactions. For industry, XUV light offers the ability to image at the nanometer scale, and to perform materials analysis with sensitivities in the ppb range. These high tech applications all require high precision optics to manipulate the light in various ways: optics that reflect, focus, transmit or filter the light. Manipulating XUV light: a challenging task!



Prof. Fred Bijkerk
head of the Focus Group

“Our type of research on XUV Optics isn’t just l’art pour l’art: we do carry out basic physics research, but we are inspired by solving problems from practice in industry or society at large. The reward of having technological success is tremendous.”

Industrial Focus Group XUV Optics

The development of such optics for the XUV wavelength range is the goal of the ‘Industrial Focus Group XUV Optics’: it aims to serve a range of scientific applications and high tech industrial uses. The Focus Group is composed of researchers that place it among the top groups in nanotechnology and excels at gearing fundamental research to the specific questions and needs of science and industry. Industrial partners join from the first onset of technological developments to gain strategic advantages in product development.

Applications

The work of the XUV Focus Group has applications in the fields of photolithography, materials analysis, spectroscopy and microscopy. Examples of these optics are found in X-ray space telescopes, PANalytical’s spectrometers, and in ASML’s wafer steppers. Indeed, the XUV Focus Group’s research has been key to the development of high-resolution photolithography, enabling a new generation of computer chips.

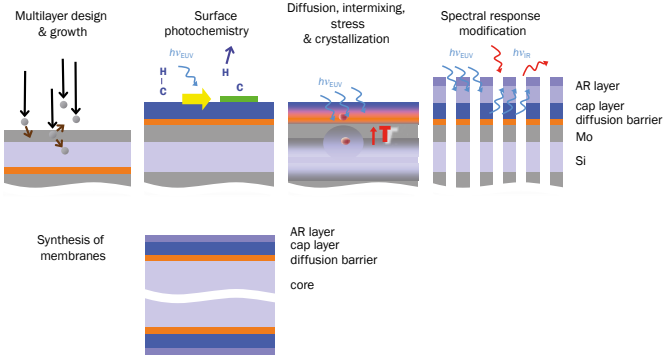
Industrial partners

The consortium of supporting parties includes ASML, Carl Zeiss SMT, PANalytical, and TNO, as well as various national and EU science and technology funding agencies. The Focus Group is also sponsored by the Province of Overijssel.

Physics programme

At the heart of XUV optical elements is the multilayer mirror, consisting of many alternating layers of two or more materials. The performance of the optics depends on the design, the precision, and the durability of this multilayer. To obtain the ultimate quality, the research programme of the Focus Group covers fundamental studies on the design and growth of multilayered structures, the

optimisation of their spectral response, the minimization of optical losses, the control of XUV-induced surface processes, and the development of coating and nanostructuring techniques.
Durability studies take into account the influence of photo-, plasma- and temperature-induced processes on the optics' performance. The programme also encompasses the development of multilayer optics, detection strategies, and on-line cleaning processes while meeting the stringent demands of optics applications.



Facilities

The experimental facilities for the optics and materials research are all state-of-the-art. They consist of several ultra-high vacuum cluster tools including multi-method deposition chambers, facilities for x-ray photoelectron spectroscopy, high-sensitivity low-energy ion scattering, and spectroscopic

Mr. Theo Rietkerk
Executive member for Economy, Energy and Innovation,
Province of Overijssel

"The incorporation of this research group at the MESA+ Institute, fifth on the world ranking list of innovations in nanotechnology, will produce spin-off effects such as the creation of numerous jobs and partnerships with local businesses. It will also attract additional major companies, as was the case with Carl Zeiss SMT and ASML."

ellipsometry. Analysis is possible through at-wavelength high precision reflectometry, high resolution diffractometry, white light interferometry and atomic force microscopy.

Complete multilayer structures are fabricated in several dedicated facilities that can perform either magnetron, ion-beam, laser, or e-beam deposition. For the investigation of XUV-induced processes, the Focus Group has an experimental set-up for thermal desorption and in-situ infrared spectroscopy, which is attached to an XUV light source at ASML (Veldhoven).

Time path

The XUV Focus Group was born from the FOM Institute DIFFER, a part of the Netherlands Organisation for Scientific Research, NWO, and is hosted by the University of Twente's MESA+ Institute for Nanotechnology. Having started in 2013, the group runs an eight year, 20 M€ research programme that includes around 12 scientific, technical and administrative staff, and 25 PhD, PDEng, and PostDoc members.

Mr. Henk Kamp
Minister of Economic Affairs

"This new XUV Optics research group is of national and international importantance for economy: I am very impressed. This is a forefront research development and most exciting to witness."

Prof. Dave Blank
Director of the MESA+ Institute for Nanotechnology

"The Focus Group's research perfectly complements work being carried out at MESA+. Developments in the field of XUV optics are vital to the next generation of equipment for creating nanostructures. MESA+'s existing expertise and the group's research work will

MESA+
INSTITUTE FOR NANOTECHNOLOGY

UNIVERSITY OF TWENTE.

NWO

ASML

ZEISS

PANalytical

TNO

provincie Overijssel

Contact

Prof.dr. Fred Bijkerk: f.bijkerk@utwente.nl, +31 53 489 61 70,
or Mrs. Jacqueline Emmerich at secretariaat-xuv-tnw@utwente.nl,
or +31 53 489 21 30. **www.utwente.nl/mesaplus/XUV**