

EDWARDS VACUUM FUELS JENA UNIVERSITY'S RESEARCH ON 2D MATERIALS

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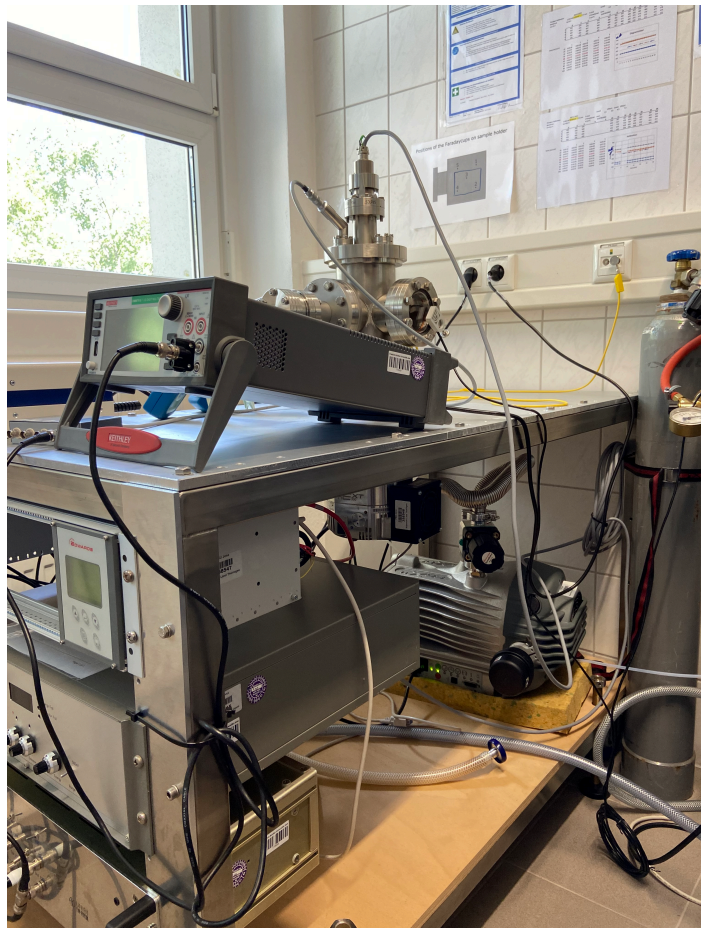
Friedrich Schiller University Jena, renowned for its contributions to optics and quantum physics, has found a valuable partner in Edwards Vacuum.

For over eight years, Edwards has been supplying essential vacuum pumps and gauges, enabling the university's cutting-edge research on 2D materials within the group of Applied Physical Chemistry & Molecular Nanotechnology led by Prof. Andrey Turchanin. As a result, this collaboration has paved the way for technological advancements in fields such as electronics, energy storage, and photonics.

A LEGACY OF EXCELLENCE

Friedrich Schiller University Jena is a prestigious research institute in Germany. Established in 1558, it is one of Germany's oldest universities and is renowned for its academic excellence. The university has made significant contributions to optics, photonics, and quantum physics, earning widespread international recognition.

Friedrich Schiller University Jena has been a loyal customer of Edwards Vacuum, relying on their vacuum pumps for setups that primarily focus on manipulating and characterising 2D materials within the group of Applied Physical Chemistry & Molecular Nanotechnology.



Friedrich Schiller University Jena: Electron Irradiation System



CUSTOMER CHALLENGE

the elimination of any contamination risks from their vacuum setups, assurance of an oil-free environment.



OUR SOLUTION

a comprehensive range of vacuum pumps backed by the latest technologies, proven expertise and a shared vision on innovation.



THE RESULT

a partnership that has not only contributed to scientific discovery but has also fostered technological innovation.

ELECTRON IRRADIATION SYSTEM

Edwards' pumps and gauges are vital in creating and maintaining the necessary conditions for experiments conducted at Friedrich Schiller University Jena. One of the key applications is the **electron irradiation system**, where low-energy electrons are directed at self-assembled monolayers (SAMs) to create 1 nm thin carbon nanomembranes (CNMs). CNMs stand out in this group of 2D materials with special properties such as high mechanical stability, adjustable chemical functionality, tunable porosity, and high transmittance to light¹.

The vacuum chambers in these systems are equipped with Edwards' nEXT turbomolecular pumps, nXDS dry scroll pumps, WRG gauge and a TIC controller. These pumps evacuate unwanted molecules and ions from the chamber, allowing researchers to achieve high-vacuum conditions for the desired molecular-scale cross-linking for fabrication of CNMs.



"Dry pumps play a crucial role in maintaining the purity of our research. Edwards' dry pumps have proven to be instrumental in eliminating any contamination risks from our setups. By ensuring an oil-free environment, Edwards' pumps provide the cleanliness and confidence we need to carry out our work with precision. Additionally, we are operating in a more sustainable manner." Christof Neumann - Scientist at Friedrich Schiller University Jena

MASS SPECTROMETER

The successful operation of the university's **mass spectrometer** setup heavily relies on its nEXT turbomolecular pump and nXDS scroll pump. These pumps are responsible for establishing and maintaining an ultra-high vacuum environment, guaranteeing precise analysis of samples and enabling the study of gas behaviour through 2D materials².

CHEMICAL VAPOUR DEPOSITION REACTORS

To facilitate the growth of 2D materials like graphene and transition metal dichalcogenides (TMDs), Friedrich Schiller University Jena utilises **chemical vapour deposition reactors** equipped with RV rotary vane pumps and APG pirani gauges. These pumps are responsible for evacuating the glass tubes within the reactors, creating the precise low-pressure environment necessary for optimal material growth³.

PLASMA SYSTEM

Another important application of vacuum pumps at Friedrich Schiller University Jena is the **reactive ion etching system**. Using nXDS dry scroll pumps, researchers generate the vacuum needed for the creation of oxygen or argon plasma, which they employ for cleaning samples and substrates. The clean samples are essential for precise molecular-scale measurements and subsequent analysis.

NANOSENSOR LABORATORY

Researchers at the university's **nanosensor laboratory** utilise the TIC cart pumping station, featuring nEXT turbomolecular pumps, nXDS dry scroll pumps, and active gauges like the WRG gauge and a TIC controller. This setup enables the accurate measurement of the electrical and optoelectronic properties of 2D materials in a high-vacuum, playing a critical role in assessing their applicability in electronic and photonic devices⁴.

AN EMPOWERING PARTNERSHIP

The collaboration between Edwards Vacuum and the Friedrich Schiller University Jena has significantly enhanced the research capabilities of the university. The reliable and efficient vacuum pumps ensure that the experiments are conducted in a controlled environment, free from unwanted contaminants and interference. This is crucial for obtaining accurate and reproducible results in the study of 2D materials.



Friedrich Schiller University Jena vacuum pump setup: RV3, nXDS and accessories



"Edwards' products excel in terms of reliability and longevity. Their equipment consistently provides the reliable performance we need for our research, demonstrating excellent durability over extended periods. The products are very user serviceable, so no need to call in a service engineer."

Christof Neumann – Scientist at Friedrich Schiller University Jena

According to Christof, Edwards has been a highly supportive and responsive partner, addressing the needs of the university in a prompt and efficient manner. He mentioned the availability of dedicated contacts, minimising the risk of potential disruptions to their operations. Furthermore, he appreciated the valuable resources in the form of instruction videos on maintenance and repair provided by Edwards.



"It's not just about providing the right product, but also offering excellent service. We prioritise fast communication and delivery of service supplies whenever Friedrich Schiller University Jena requires them. Our utmost priority is to meet the needs of our clients and ensure they are equipped with the latest systems."

Johannes Stefanski - Sales Engineer Scientific Vacuum at Edwards

Through the provision of reliable vacuum solutions, Edwards has empowered researchers to explore new frontiers in material synthesis, manipulation, and characterisation. This partnership has not only contributed to scientific discovery but has also fostered technological innovation, paving the way for breakthroughs in various applications.

The pivotal role of Edwards Vacuum in creating and maintaining optimal experimental conditions highlights the value of industry-university collaborations in driving research progress and facilitating technological advancements.

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More about **Applied Physical Chemistry & Molecular Nanotechnology** led by Prof. Andrey Turchanin (<https://www.apc.uni-jena.de/>).



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