Investigation of excited-state dynamics of BN-doped pyrene in the gas phase

Research Internship at JMU

Prof Dr. Ingo Fischer's Lab

Personal Report

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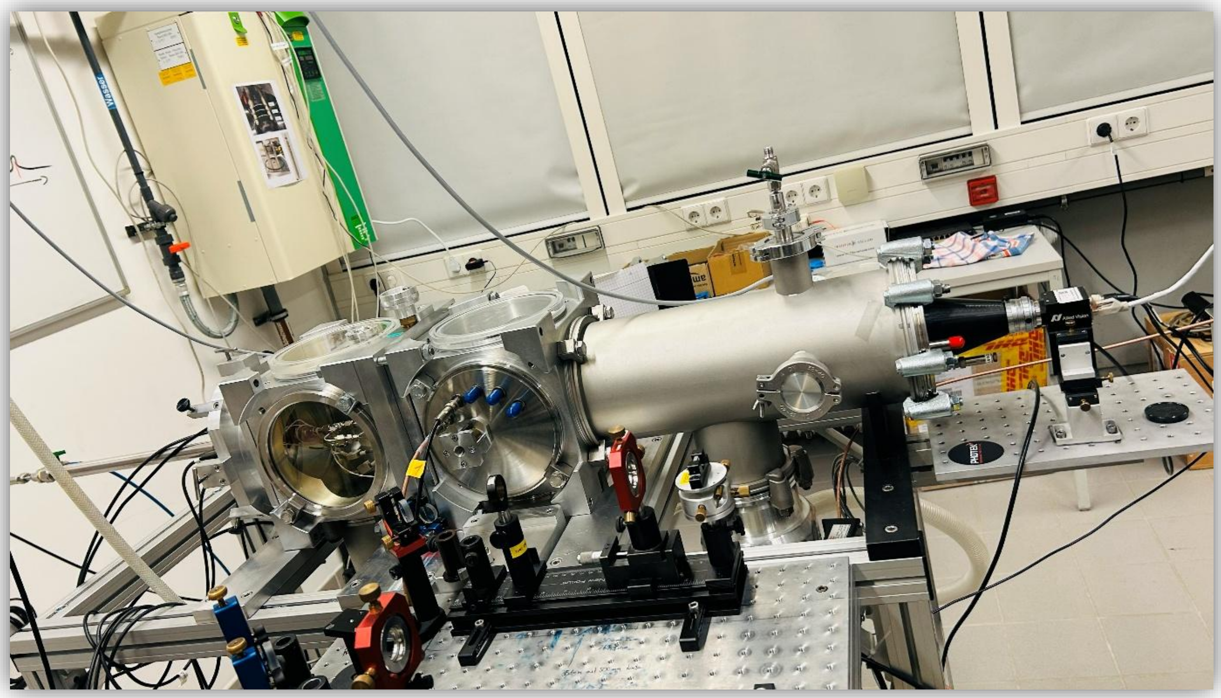

Image 1 : Molecular beam and interaction chamber

During my research internship, I investigated the excited-state dynamics of BN-doped pyrene in the gas phase to elucidate its intrinsic photophysical behavior in the absence of solvent and intermolecular effects. The study was conducted using a time-resolved resonance-enhanced multiphoton ionization (TR-REMPI) technique (As shown in all images), which enables the state-selective and temporally resolved probing of isolated molecules.

Image 2 : Molecular beam source assembly

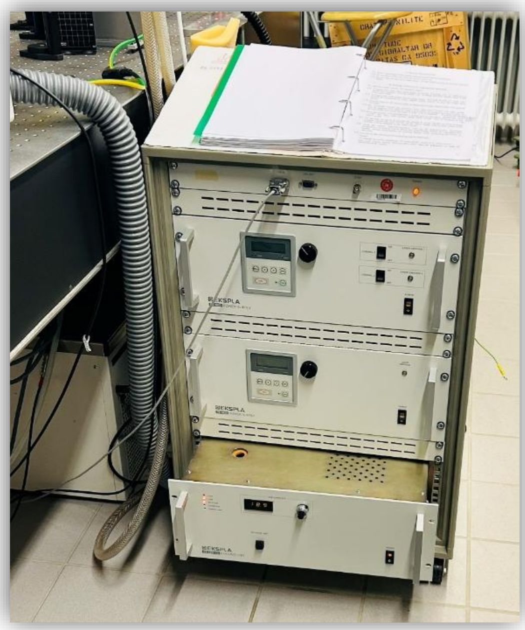

Image 3 : Electronic control and power units of laser

This image shows the electronic control units and power supplies used for operating the molecular beam source, vacuum components, and timi electronics. Stable control of these parameters is critical for reproducible pump–probe delay measurements in TR-REMPI experiments.

Image 4 :Laser laboratory and beam delivery

BN-pyrene was introduced into the gas phase using a supersonic molecular beam expansion, generating cold and well-collimated molecular packets. These packets were skimmed and guided using electrostatic optics before ion detection following passage through a field-free time-of-flight region. Excited-state dynamics were examined using a pump–probe scheme, in which the pump laser excited the molecules to the target electronic state and a delayed probe pulse at 263.5 nm ionized the excited species. By scanning the pump–probe delay, the images document key aspects of the experimental setup, including the molecular beam source, laser–molecule interaction region, and the time-of-flight detection system, providing visual context to the TR-REMPI methodology employed in this work.

The image presents the laser laboratory environment, including enclosed beam paths and optical components used for pump–probe measurements. Femtosecond laser pulses are guided into the interaction region to excite and subsequently ionize the molecular beam with precise temporal control.

Image 5 : GIANT Field Trip and Academic Exchange

In addition to laboratory research, I participated in several academic and professional development activities. I attended a Cross-Cultural Communication

Workshop, which focused on effective communication in international research environments, team dynamics, and cultural sensitivity in academia. This workshop was particularly valuable in enhancing my awareness of collaborative practices in a diverse scientific setting.

I also took part in a GIANT field trip to the Zollhof Tech Incubator, Nuremberg (04.12.2025). The visit provided insights into the innovation ecosystem, technology transfer, and the role of start-ups in bridging fundamental research and industrial applications. Interactions with entrepreneurs and incubator representatives highlighted alternative career pathways for scientists beyond academia. Furthermore, I had the opportunity to give a scientific presentation and discussion session with Prof. Frank Würthner, where I presented my research carried at AKF.

Overall, this internship significantly strengthened my experimental expertise in gas-phase spectroscopy and time-resolved techniques, while also contributing to my professional growth through interdisciplinary exposure, and international academic engagement.