Towards combining laser desorption/laser ionization expertise with Fourier transform mass spectrometry (FTMS)

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Résumé

The ANATRAC group (*ANAlyse de TRACes*), part of the PhLAM laboratory (*Physique des Lasers, Atomes et Molécules*), has extensive experience in laser desorption/ionization techniques, combined with time-of-flight mass spectrometry (L2MS). This approach has been applied across a range of research areas, including astrochemistry,(Slavicinska et al. 2022) exobiology,(Thlaijeh et al. 2024) soot particles,(Duca et al. 2021) and the study of synthetic polymers.(Oumeddour et al. 2024)
Initially, L2MS methods were developped to focus on specific compound classes. Lately, analysis of polycyclic aromatic hydrocarbons (PAHs) was performed using wavelengths of 532 nm for desorption and 266 nm for ionization. For these molecules-composed mainly (or exclusively) of carbon and hydrogen-the resolution (up to 50,000) and m/z accuracy (_˜10 ppm) provided by TOF instruments were generally sufficient.

However, as the laboratory increasingly investigates organic samples with unknown and complex elemental compositions, such as extraterrestrial samples, the limitations of TOF systems become more apparent. Isobaric species may be simultaneously detected, and the available m/z accuracy are often insufficient to unambiguously determine molecular formulas. To overcome these challenges, a new project (PEPR Origins) has been launched. One of its goal is the development of a μL2-FTMS instrument, combining the advantages of laser desorption/laser ionization with the ultra-high resolution of FTMS.
This presentation will overview the research thematics of ANATRAC group, emphasizing the need for a very high resolution instrument.

Mots-Clés: L2MS, laser desorption, laser ionization, PEPR Origins

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