Abstract

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Edita Rados, Ernst Pittenauer, Johannes Frank, Kurt Varmuza, Günter Allmaier:

A laser desorption ionization/matrix-assisted laser desorption ionization target system applicable for three distinct types of instruments (LinTOF/curved field RTOF, LinTOF/RTOF and QqRTOF) with different performance characteristics from three vendors.

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Rationale: We have developed a target system which enables the use of only one target (i.e. target preparation set) for three different laser desorption ionization (LDI)/matrix-assisted laser desorption ionization (MALDI) mass spectrometric instruments. The focus was on analysing small biomolecules with LDI for future use of the system for the study of meteorite samples (carbonaceous chondrites) using devices with different mass spectrometric performance characteristics.

Methods: Three compounds were selected due to their potential presence in meteoritic chondrites: tryptophan, 2-deoxy-D-ribose and triphenylene. They were prepared (with and without MALDI matrix, i.e. MALDI and LDI) and analysed with three different mass spectrometers (LinTOF/curved field RTOF, LinTOF/RTOF and QqRTOF). The ion sources of two of the instruments were run at high vacuum, and one at intermediate pressure. Two devices used a laser wavelength of 355 nm and one a wavelength of 337 nm.

Results: The developed target system operated smoothly with all devices. Tryptophan, 2-deoxy-D-ribose and triphenylene showed similar desorption/ionization behaviour for all instruments using the LDI mode. Interestingly, protonated tryptophan could be observed only with the LinTOF/curved field RTOF device in LDI and MALDI mode, while sodiated molecules were observed with all three instruments (in both ion modes). Deprotonated tryptophan was almost completely obscured by matrix ions in the MALDI mode whereas LDI yielded abundant deprotonated molecules.

Conclusions: The presented target system allowed successful analyses of the three compounds using instruments from different vendors with only one preparation showing different analyser performance characteristics. The elemental composition with the QqRTOF analyser and the high-energy 20 keV collision-induced dissociation fragmentation will be important in identifying unknown compounds in chondrites