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Diagnostics of atmospheric pressure microplasma jets by means of molecular beam mass spectrometry¹

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The measurement of absolute densities of reactive species generated in the atmospheric pressure plasma jets is crucial for the understanding of the plasma physics and plasma chemistry involved and of the effects they induce during the surface treatment. However, these measurements are challenging due to high pressure and limited size of typical plasma jets. One of the techniques, which can be used for these measurements, is Molecular Beam Mass Spectrometry (MBMS). However, the collisional gas sampling into the low pressure mass spectrometer, which takes place by analysis of atmospheric pressure plasmas, has to be carefully considered and evaluated. The design and a calibration scheme of the MBMS system will be presented here and its capabilities will be demonstrated on the measurements of O and O₃ species in He/O₂ jet and on the analysis of plasma chemistry products generated in the He/HMDSO/O₂ microplasma jet. Additionally, the detection of ions in the plasma effluent and their relevance for the inactivation of vegetative bacteria will be discussed as well.

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