A Novel Method for the Separation and Detection of Macroscopic Particles Using Ion-Trap Mass Spectrometry in the Presence of Atmospheric Gases

Meyer, Jannik (School: Jacob-Grimm-Schule Kassel)

A prerequisite for conventional mass spectrometry is the transfer of a sample into the gaseous phase followed by its ionic fragmentation in a vacuum. The technical limitations of conventional mass spectrometry are reached when complex samples with mass sizes above the microscopic scale are to be analysed. The ionization energy of a complex, macroscopic sample poses a technical challenge since it is difficult, if not impossible, to obtain macroscopic particles in an ionized, gaseous state which is required for detection. The detection of macroscopic particles is fundamentally different from analysing small molecules or macromolecular compounds. To overcome the technical limitations of conventional microscopic mass spectrometry, the objective of the present research is to construct a new and simple instrument used for the separation and laser-based detection of particles on the macroscopic scale. The proposed new device is based on the principle of ion-trap technology and intends to quantitatively assess specimens with high particle size in the absence of a vacuum system. The apparatus should be readily applicable for the quantitative investigation of macroscopic particles using ion-trap technology in the absence of a vacuum system. The proposed instrument should be inexpensive, easy to use in a broad spectrum of laboratory settings and application fields. A prototype of the device will be developed and tested both under experimental conditions and by means of mathematical simulation.

Awards Won:

Spectroscopy Society of Pittsburgh: Second Award of $1000

Fourth Award of $500