

Development of Quadrupole Ion Trap MS and Its Application

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The presentation will give an overview of the historical accounts in quadrupole ion trap. Quadrupole ion trap was invented more than 50 years. Generally, commercial quadrupole ion trap instrument has experienced three generations. This presentation will focus on the commercial instrument development, key technical breakthroughs and stories in each generation.

Tandem Mass (MS/MS and MSⁿ) Spectrometry in time is one of the most useful technologies in quadrupole ion trap. In quadrupole ion trap, the fragmentation of parent ion is accomplished by collision induced dissociation (CID). During CID period, parent ions are resonantly excited by a supplemental waveform (AC). In CID process, the amplitude of oscillation of the ions is increased enough to cause collisions with background gas and consequently dissociate the ions into product ions, but not enough to cause the ions to overcome the restoring forces and be lost. Thus, achieving high-efficiency CID conventionally has required a careful balancing of ion kinetic energy uptake so that the internal energy of parent ion accumulates sufficiently to cause dissociation while ejection of the parent ions and fragment ions is prevented. However, the supplemental AC voltage needs to be optimized individually for different ions of interest because the energy required for CID depends on the particular parent ions. In addition, the secular frequency of a given ion of interest cannot be precisely determined in advance, which made optimization of CID more complicated. In this presentation, an automated CID method will be discussed. In this method, the time-consuming AC voltage optimization is eliminated. Its application in data dependent scan (DDS) of Ginsenosides MSⁿ will be presented.

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