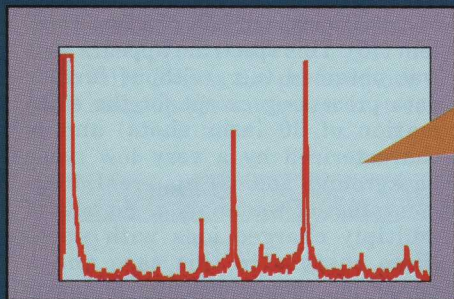


## Matrix-Assisted Laser Desorption/Ionization Mass Spectrometry of Biopolymers



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Analytical chemists and biochemists have long sought accurate, sensitive methods for determining the molecular masses of biopolymers such as proteins and carbohydrates. Traditional mass spectrometric methods, which proved so useful for measuring compounds with low molecular

masses, were of little use for measuring underivatized compounds with high molecular masses. These methods require that the biopolymer molecules normally present in the condensed phase be converted into intact, isolated ionized molecules in the gas phase. This conversion is difficult to achieve because biopolymers are polar and massive and therefore extremely nonvolatile. During the past two decades, a remarkable array of volatilization and ionization techniques has been developed to address this problematic conversion step.

These new ionization techniques include those that produce the conversion by the application of a high electric field to the sample (field desorption [1]); by bombardment of the sample with energetic ions or atoms (<sup>252</sup>Cf plasma desorption [2] and secondary ion MS [3]); by the formation of ions directly from small, charged liquid droplets (thermospray ionization [4] and electrospray ionization [5]); and by bombardment with short-

duration, intense pulses of laser light (laser desorption, or LD [6, 7]).

Of these techniques, electrospray ionization and matrix-assisted laser desorption/ionization (LDI) (8), a newly developed version of LD, appear to hold the greatest promise for the mass spectrometric analysis of biopolymers in the molecular mass range between a few thousand and a few hundred thousand Daltons. In this INSTRUMENTATION article we provide an overview of matrix-assisted LDI, particularly its principles, instrumentation, and application to biopolymer analysis. Because we are on a very steep portion of the learning curve in this new area, readers should regard this article as an interim report.

### History of LD and development of matrix-assisted LDI

Since the early 1960s lasers have been used to generate ions, including those of organic molecules, for analysis in mass spectrometers (9). Researchers



