

# ESI: Electrospray Ionization

## Application

API-electrospray (API-ES) is useful in analyzing samples that become multiply charged such as proteins, peptides, and oligonucleotides, as well as in analyzing samples that are singly charged, such as benzodiazepines and sulfated conjugates. API-ES can be used to measure the molecular weights of most polymers, peptides, proteins, and oligonucleotides up to 150,000 Daltons quickly and with high mass accuracy. In biopharmaceutical applications, chemists use API-ES to speed protein characterization, to accurately identify and characterize post-translational modifications, and to quickly confirm the molecular weight of synthetic peptides.

## Process

API-ES is a process of ionization followed by evaporation. It occurs in three basic steps: nebulization, desolvation and ion evaporation.

## Nebulization

The HPLC effluent is drawn through a nebulizing needle, which is at ground potential. The spray goes through a semi-cylindrical electrode, which is at a high potential. The potential difference between the needle and the electrode produces a strong electrical field. This field charges the surface of the liquid and forms a spray of charged droplets. There is a concentric flow of gas assists in the nebulization process.

## Desolvation

The charged droplets are attracted toward the capillary sampling orifice. There is a counter flow of heated nitrogen drying gas, which shrinks the droplets and removes the uncharged material.

## Ionization

As the droplets shrink, they approach a point where the electrostatic forces exceed the cohesive forces. This process continues until the analyte ions are in the end introduced into the gas phase. These gas-phase ions pass through the capillary sampling orifice into the low-pressure region of the ion source and the mass analyzer.

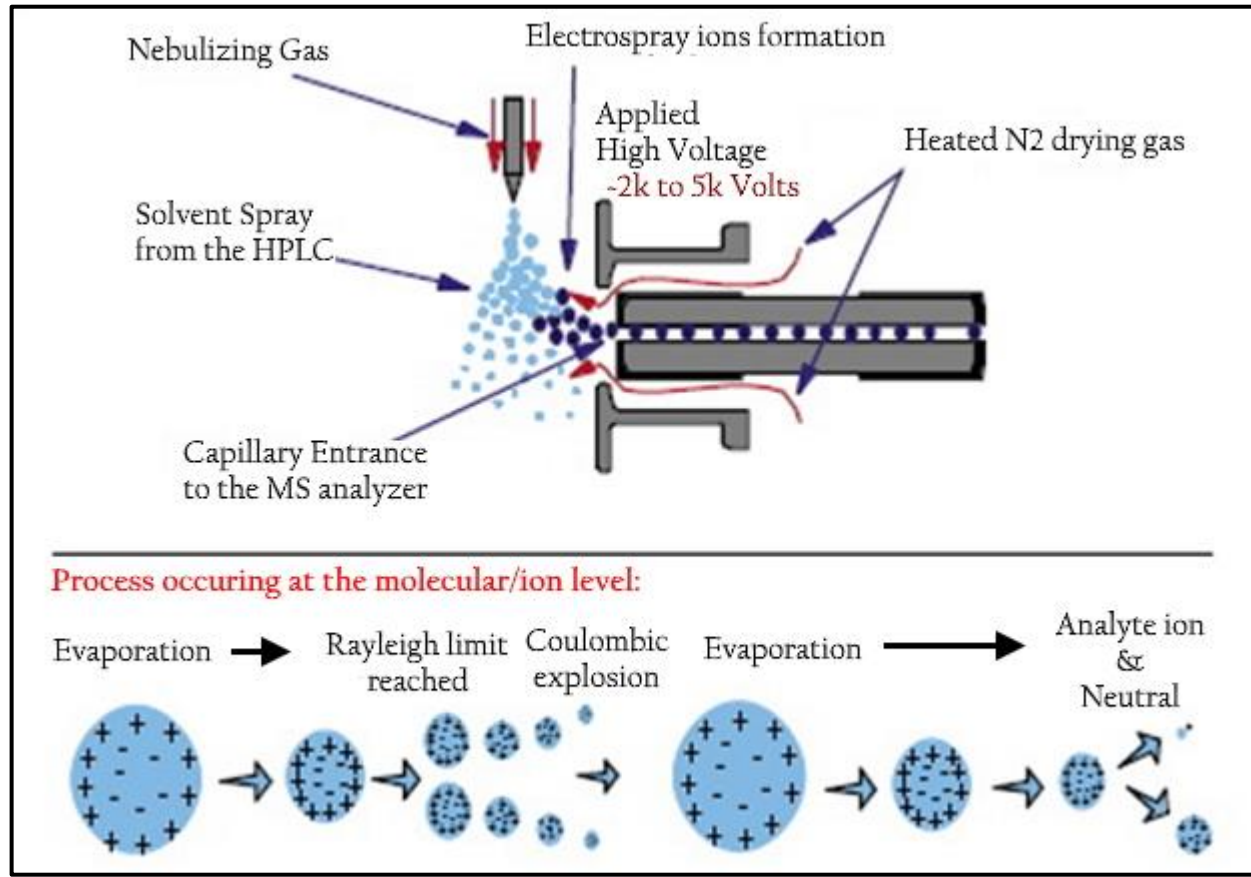


Figure 1: Schematic of the electrospray process at the source

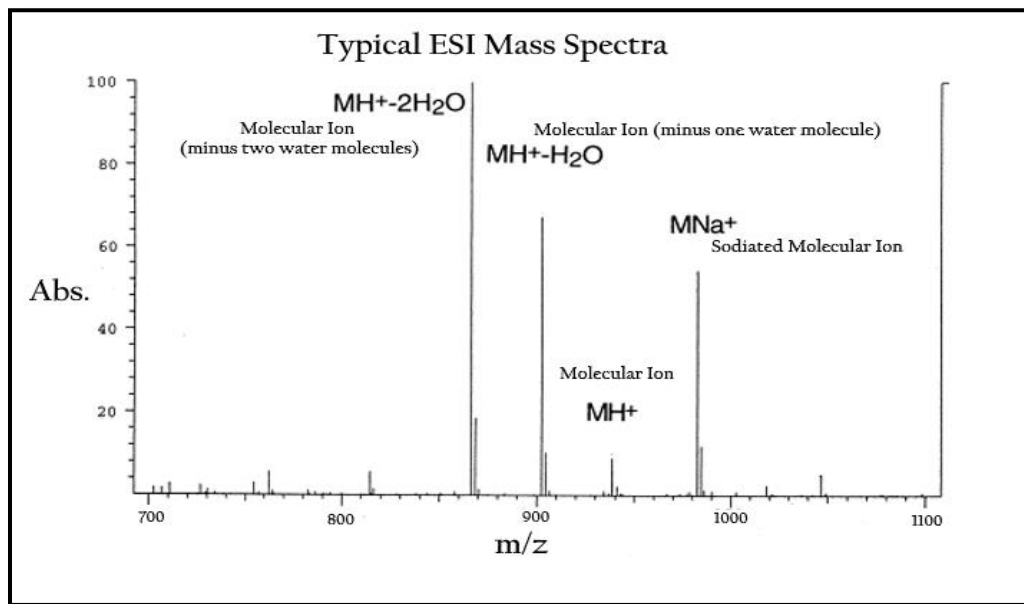


Figure 2: Typical ESI Mass Spectra

Contact the TRACES Manager for full details.