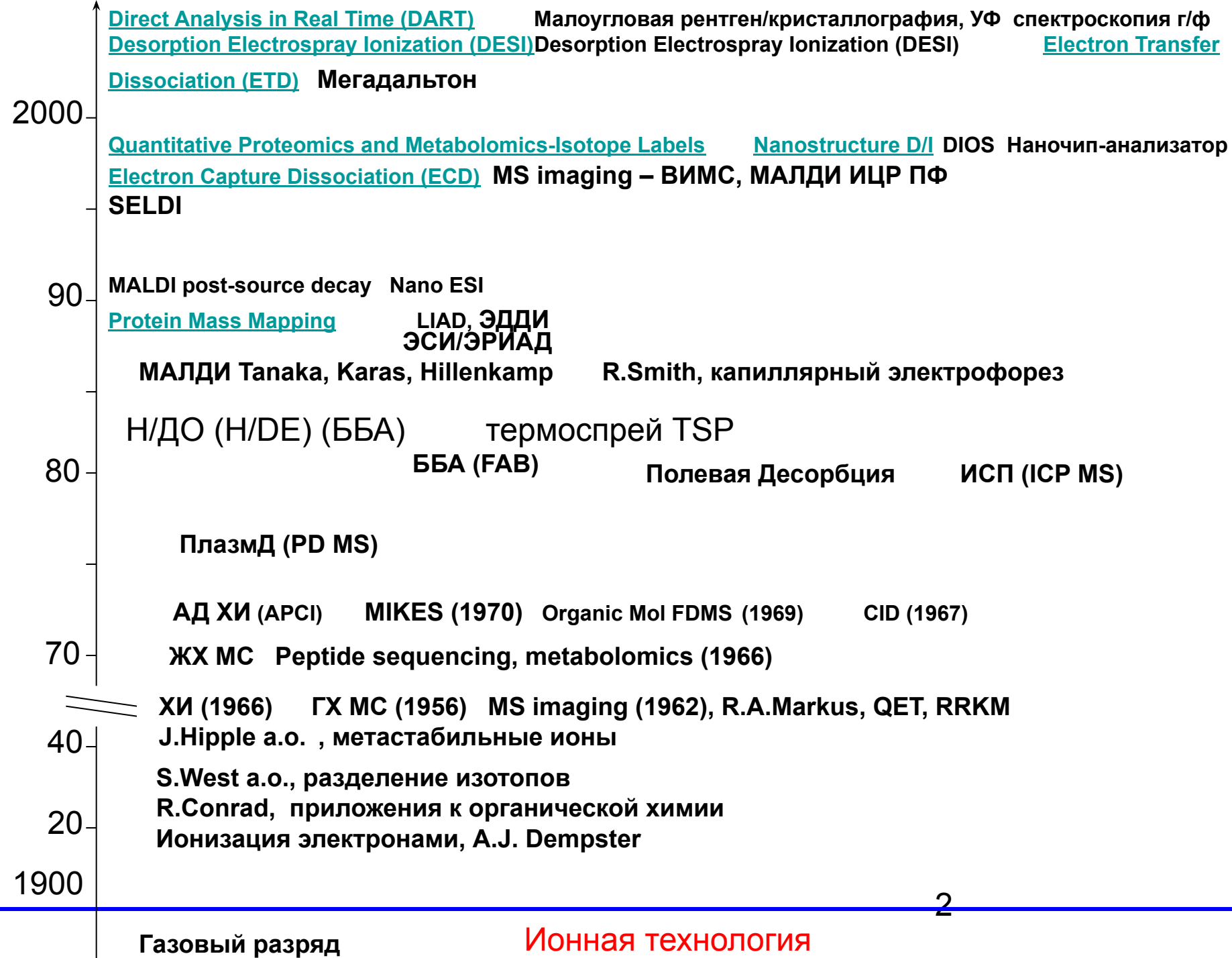
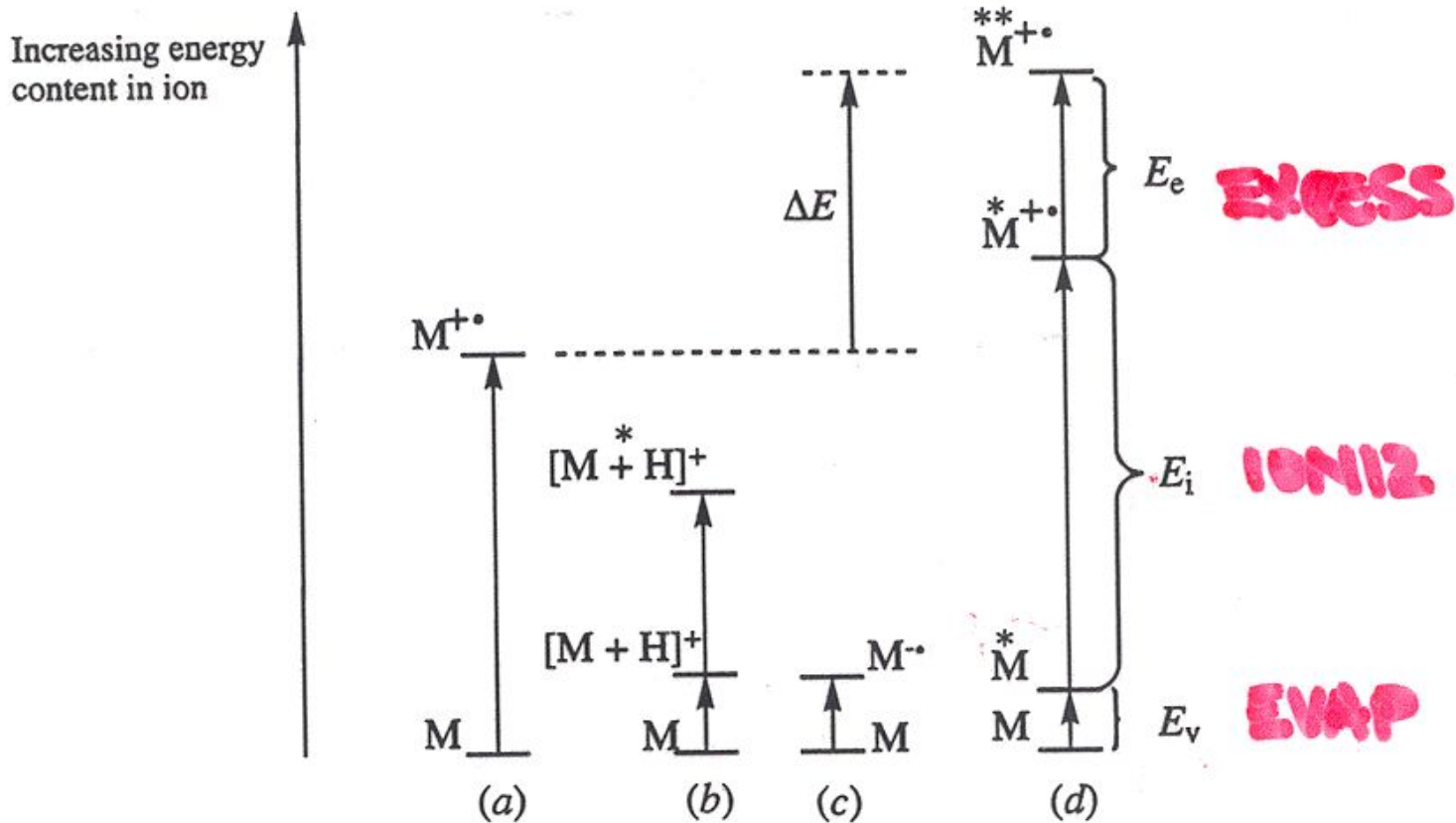


Ионная технология (ИТ МС)

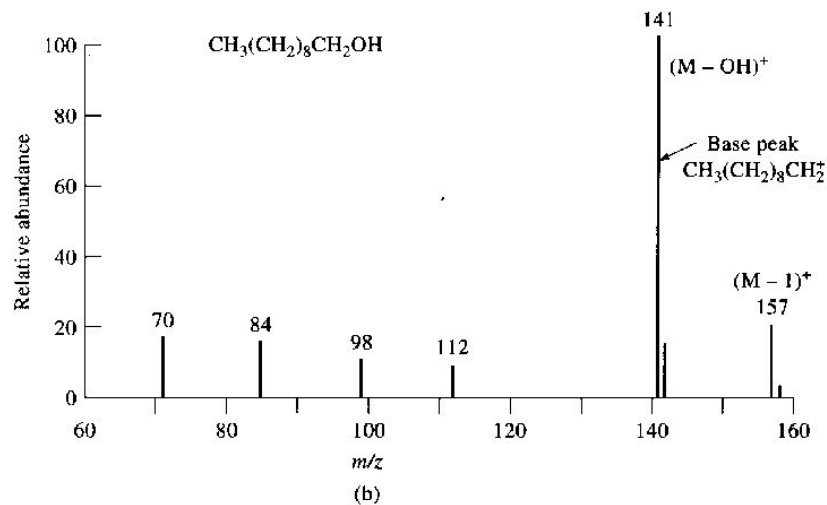
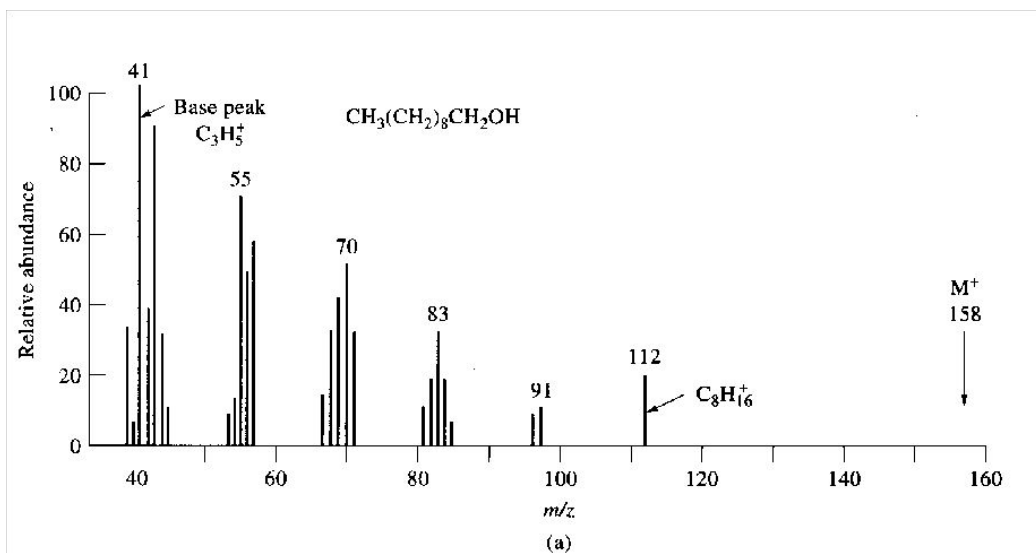
- *используется для получения из пробы ионов в газовой фазе, их преобразования, задания и определения параметров траекторий*
- *является частью более общей ионно-плазменной технологии, широко применяемой также в микро-, нано-, вакуумной и плазменной электронике и т.д.*
- *основана на многодисциплинарной научной платформе физики, химии, биологии и ряда других наук*
- *применима практически к любым объектам для реализации МС исследования*



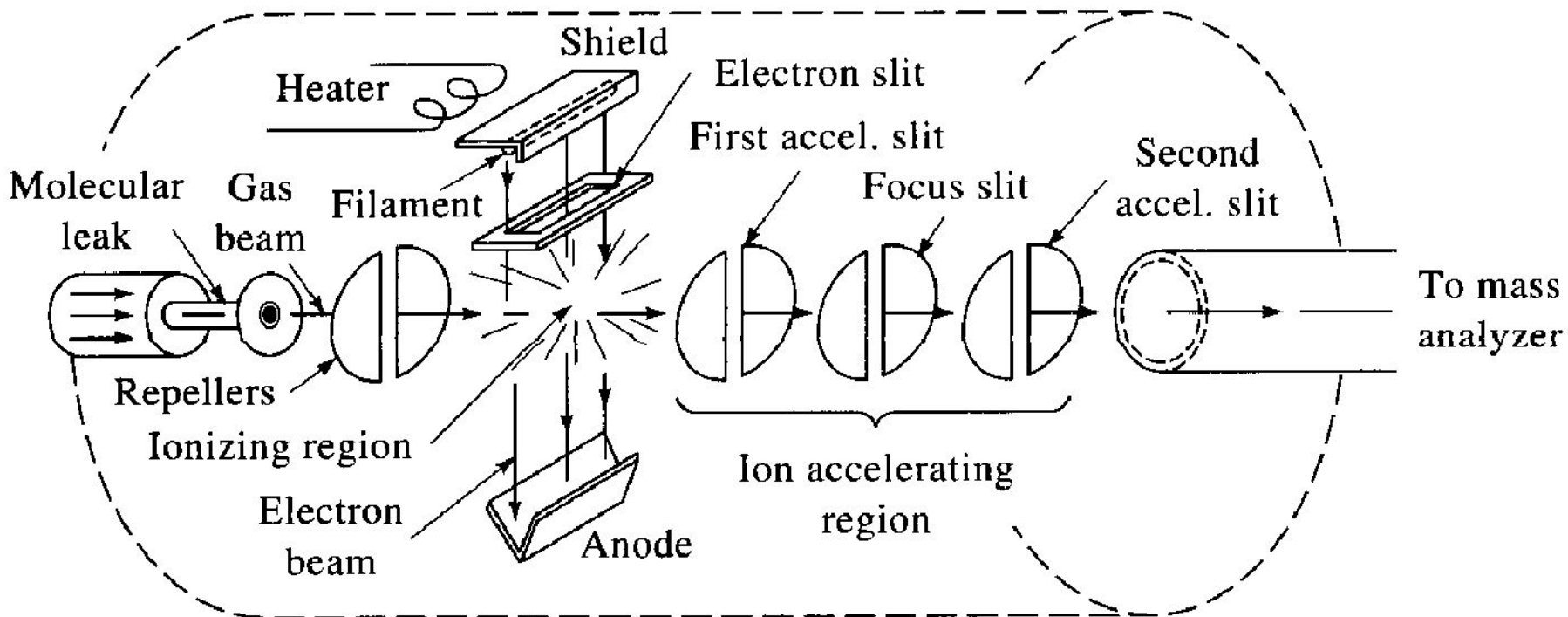
SOFT vs. HARD IONIZATION METHODS???



MS with "Hard" and "Soft" Sources



Electron Impact Source



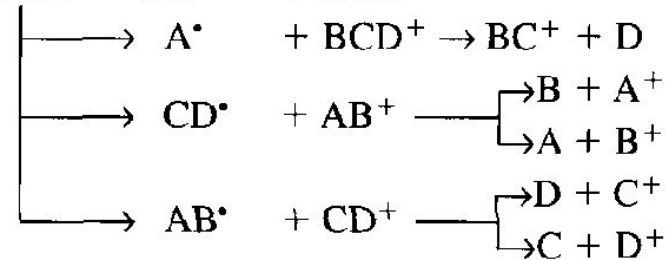
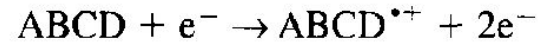
Electron Ionization (EI)



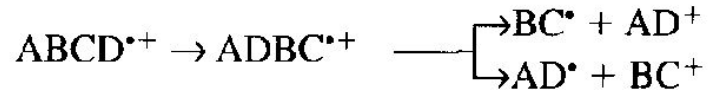
Typical Reactions during Electron Impact

Molecular ion formation

Fragmentation



Rearrangement followed by fragmentation



Collision followed by fragmentation

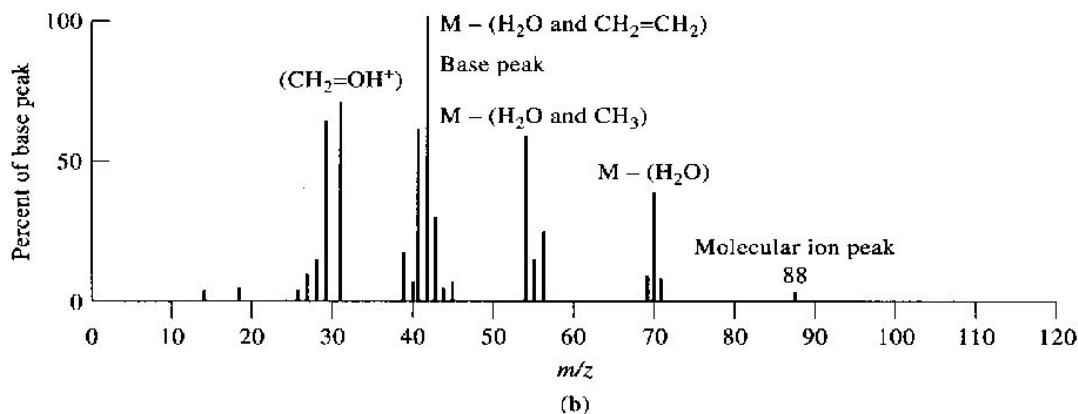
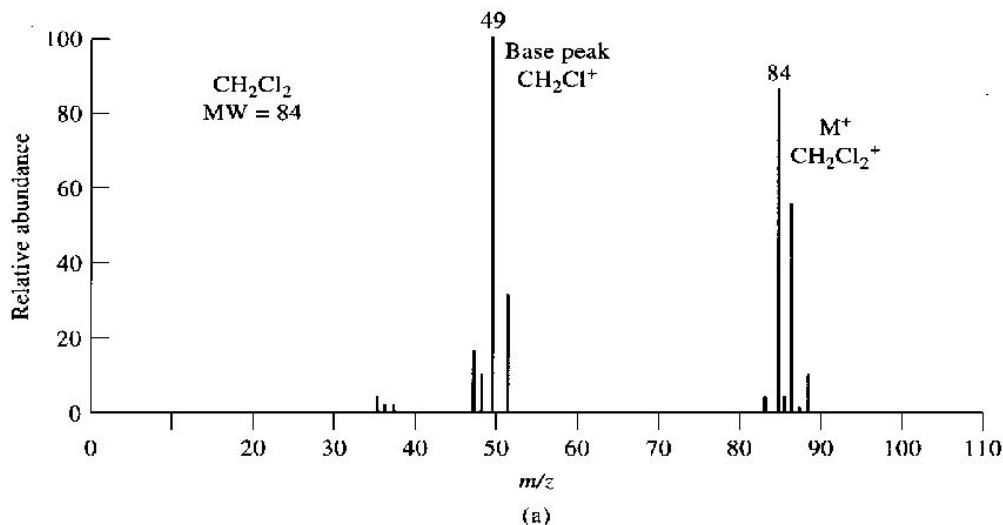


Energy = 70eV 6700 kJ/mol



Typical bond energies 200 to 600 kJ/mol EXTENSIVE FRAGMENTATION

Electron Impact Spectra

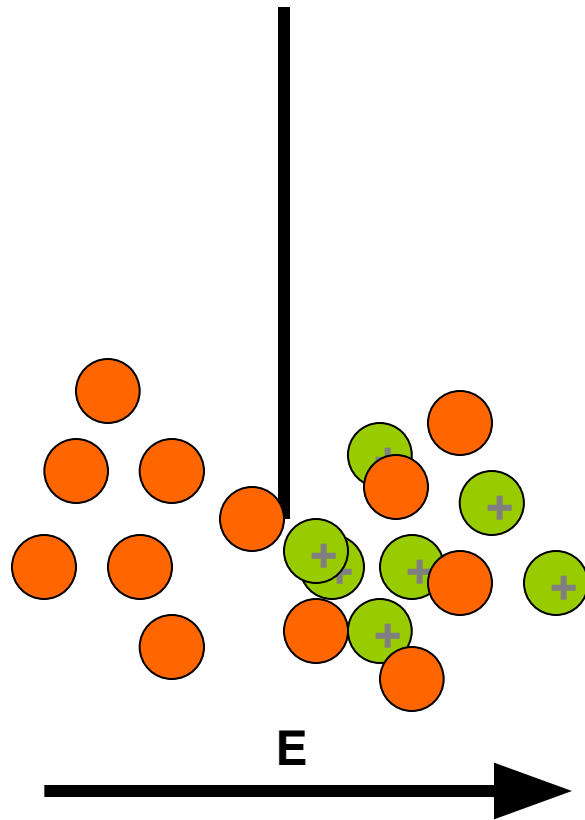


- Different molecules behave differently
- Good molecular ion **little fragmentation**
- No molecular ion **extensive fragmentation**
- Isotopes are extremely important!
- Molecular ion isotopic cluster

Ionization vs. Desorption?

FIELD IONIZATION

FIELD DESORPTION



Field Ionization Sources

Apply large electric fields to carbon dendrites on a tungsten wire

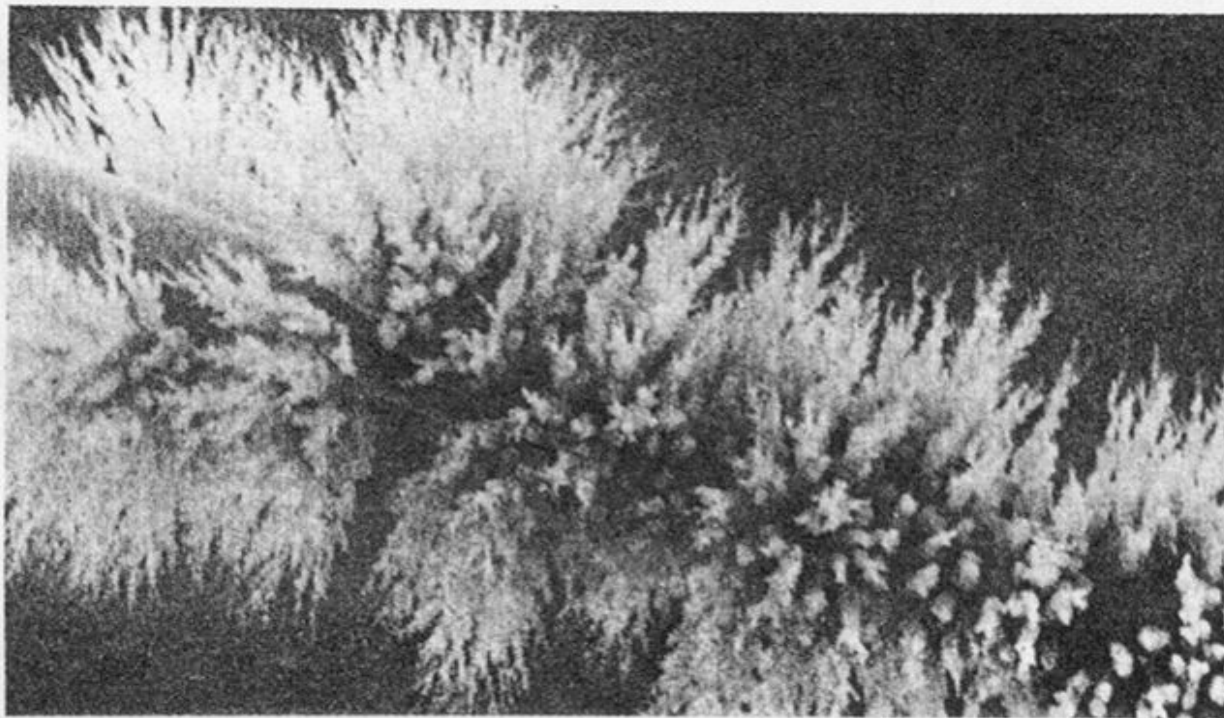
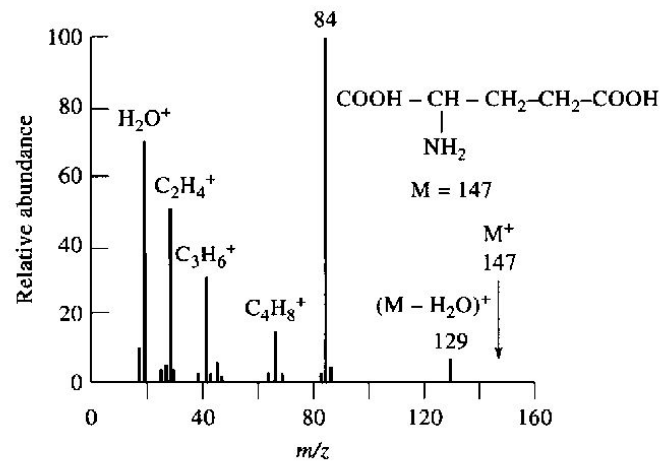


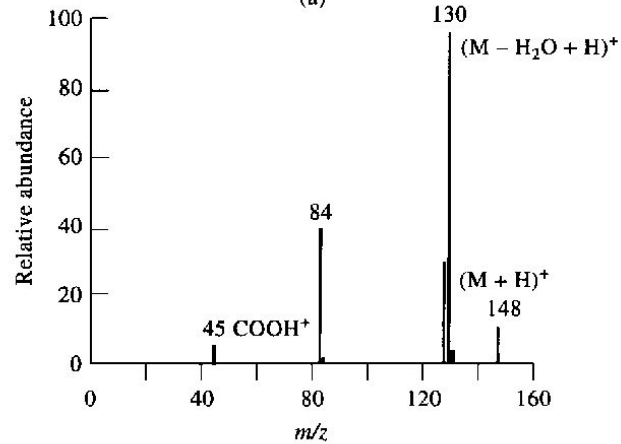
Fig. 6.1 Scanning electron micrograph ($\times 500$) of high temperature activated FD emitter. (Reprinted with permission from W.D. Reynolds *Anal. Chem.*, **51**, 283A[4]; Copyright (1979) American Chemical Society)

Glutamic Acid

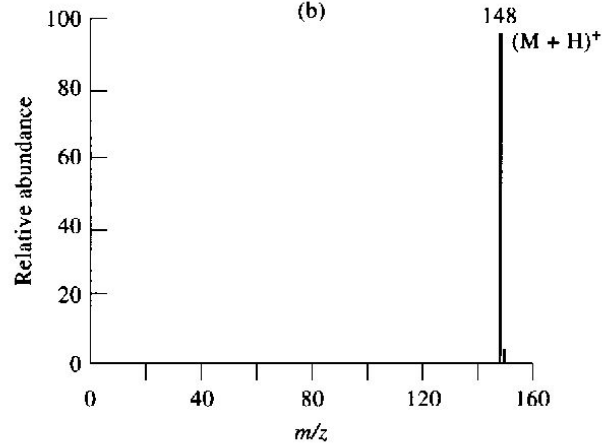
Electron Impact (EI)



(a)



(b)



(c)

Field Ionization

Field Desorption

FAB Ionization

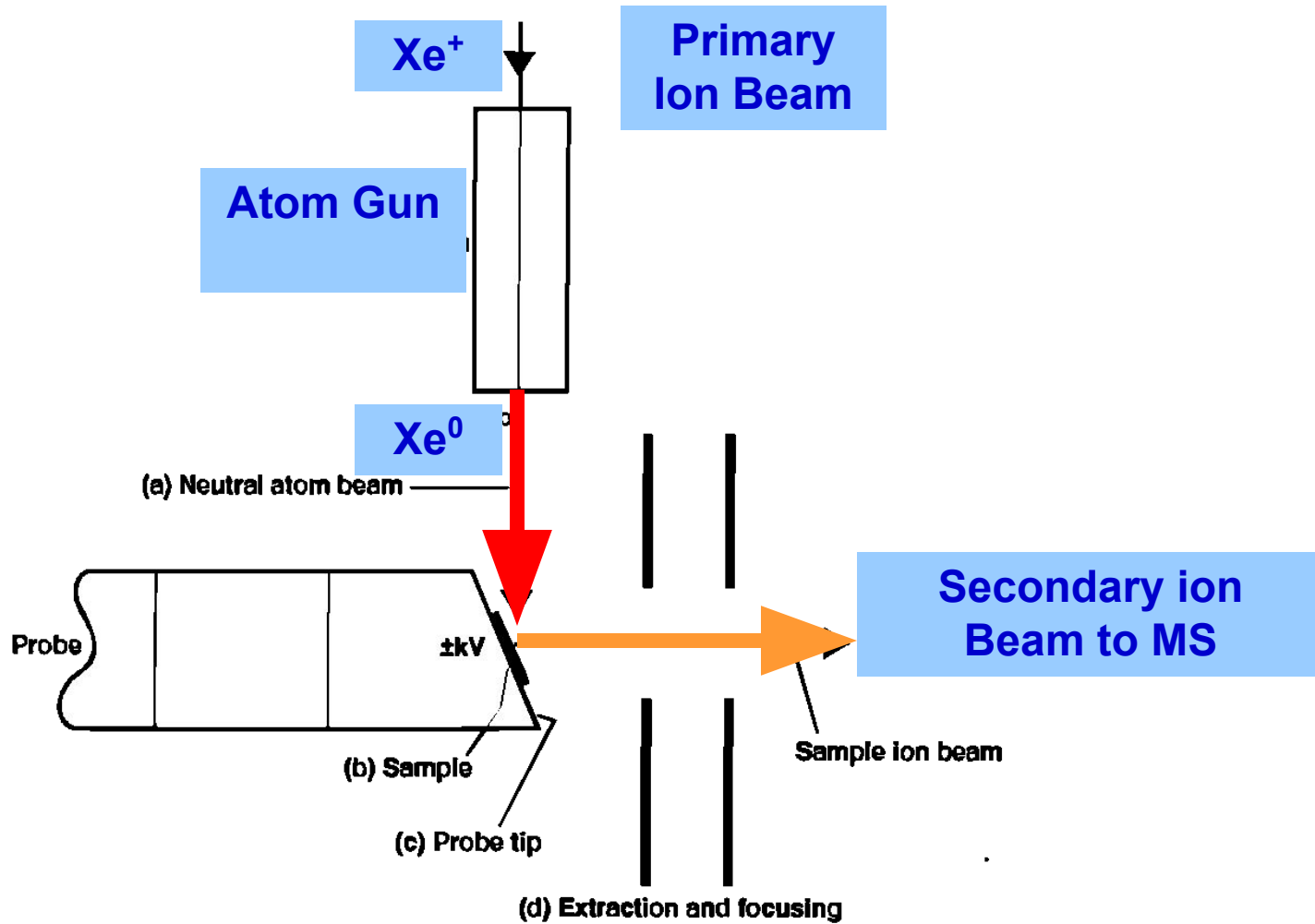
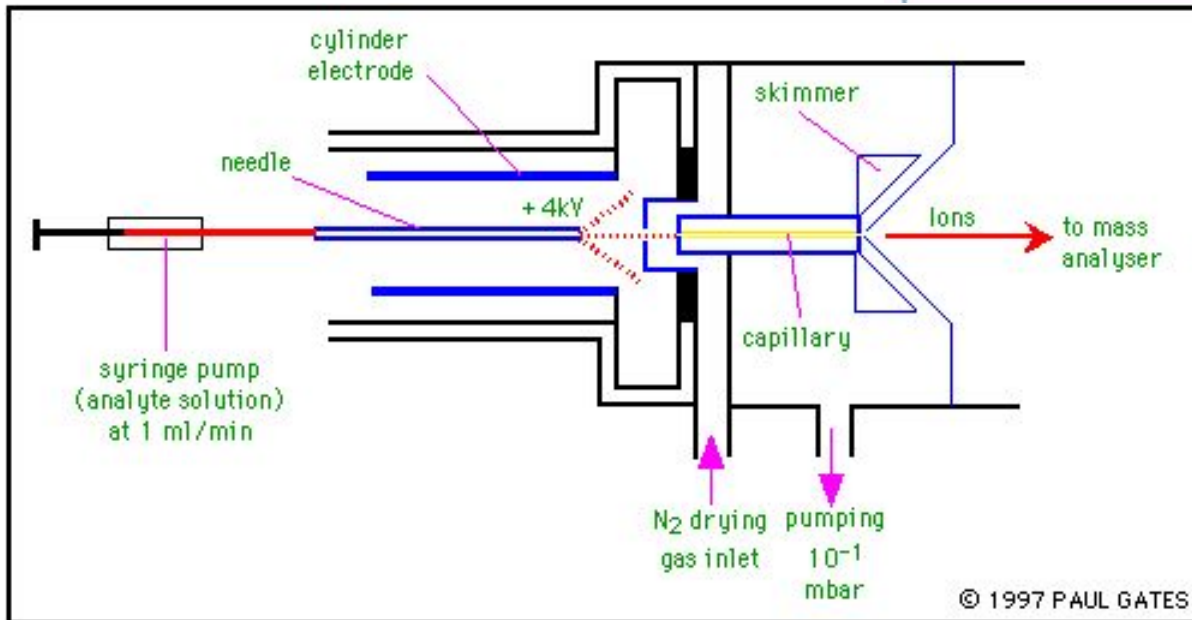
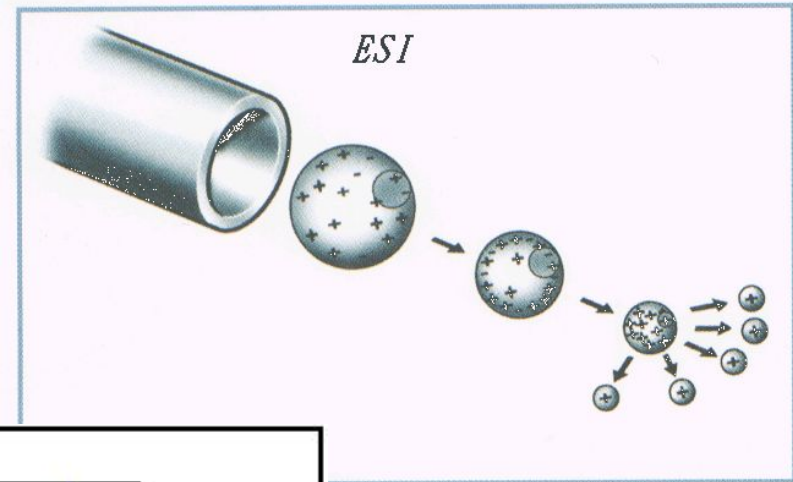


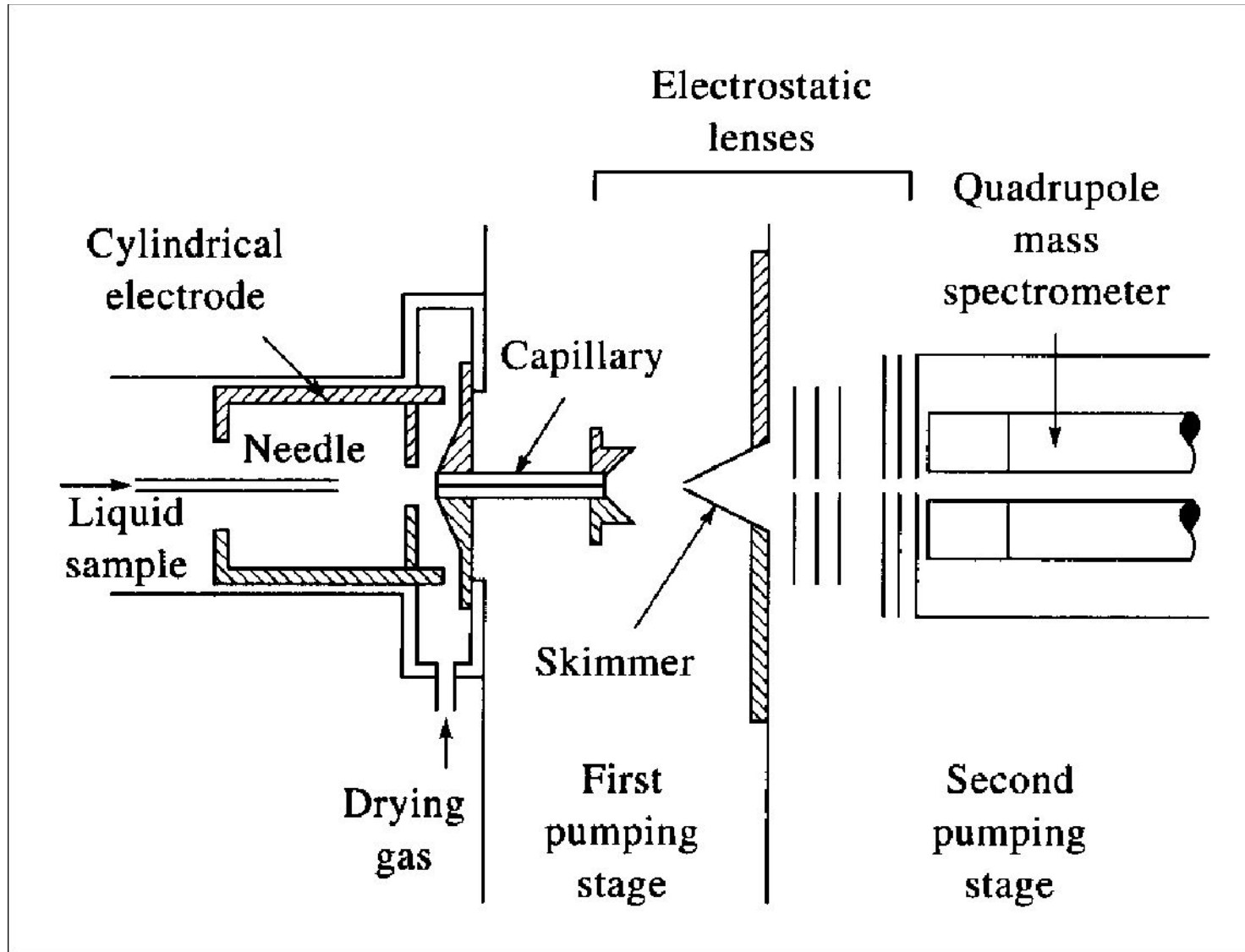
Fig. 5.4 Schematic diagram of fast ion bombardment ion source

ESI

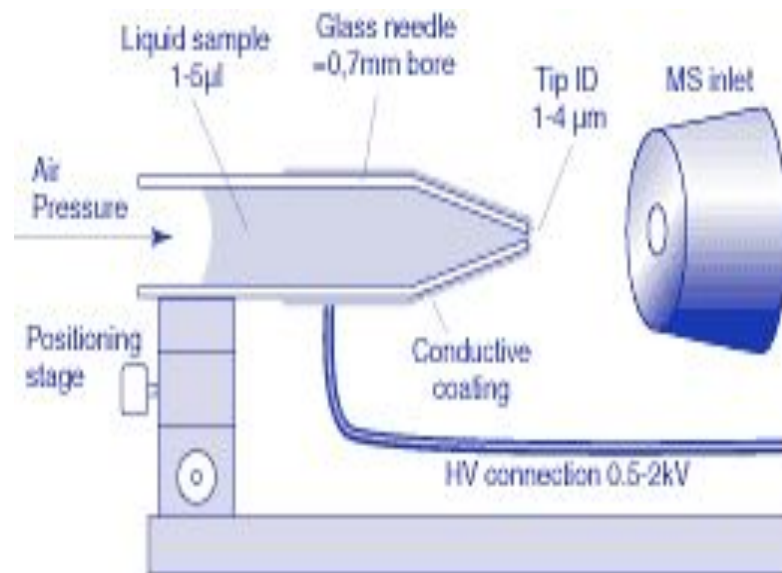
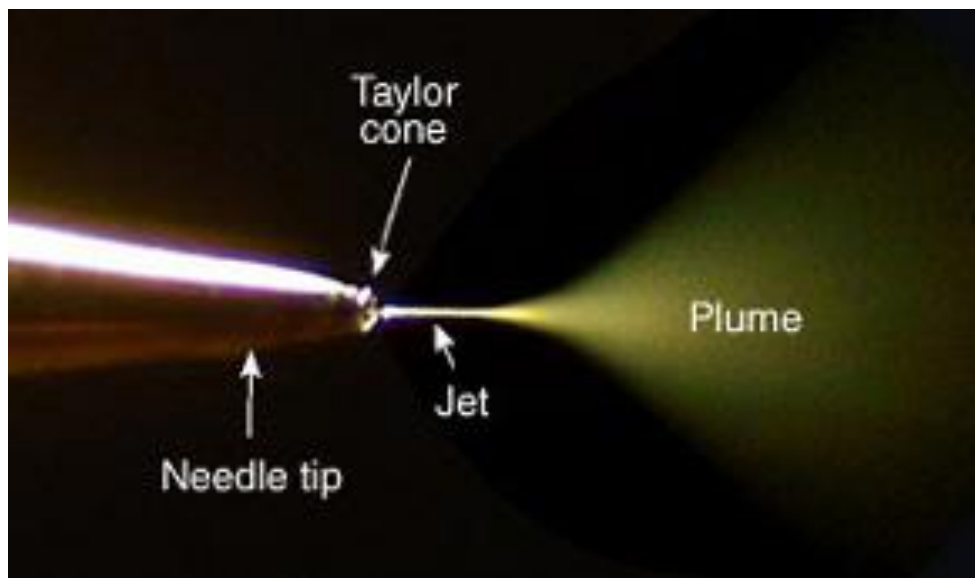
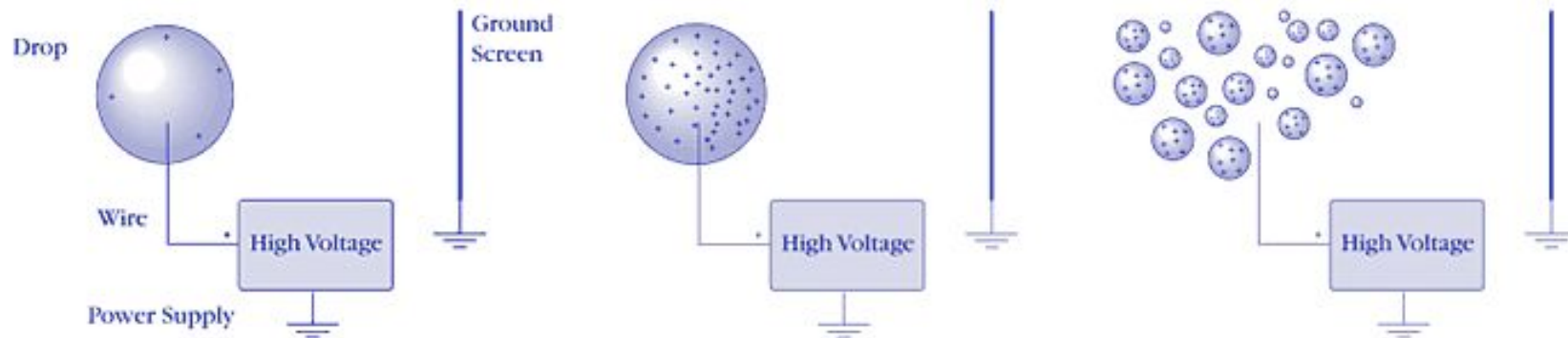
Растворители
Ацетонитрил 50%
MeOH 50%
0.1 HCOOH



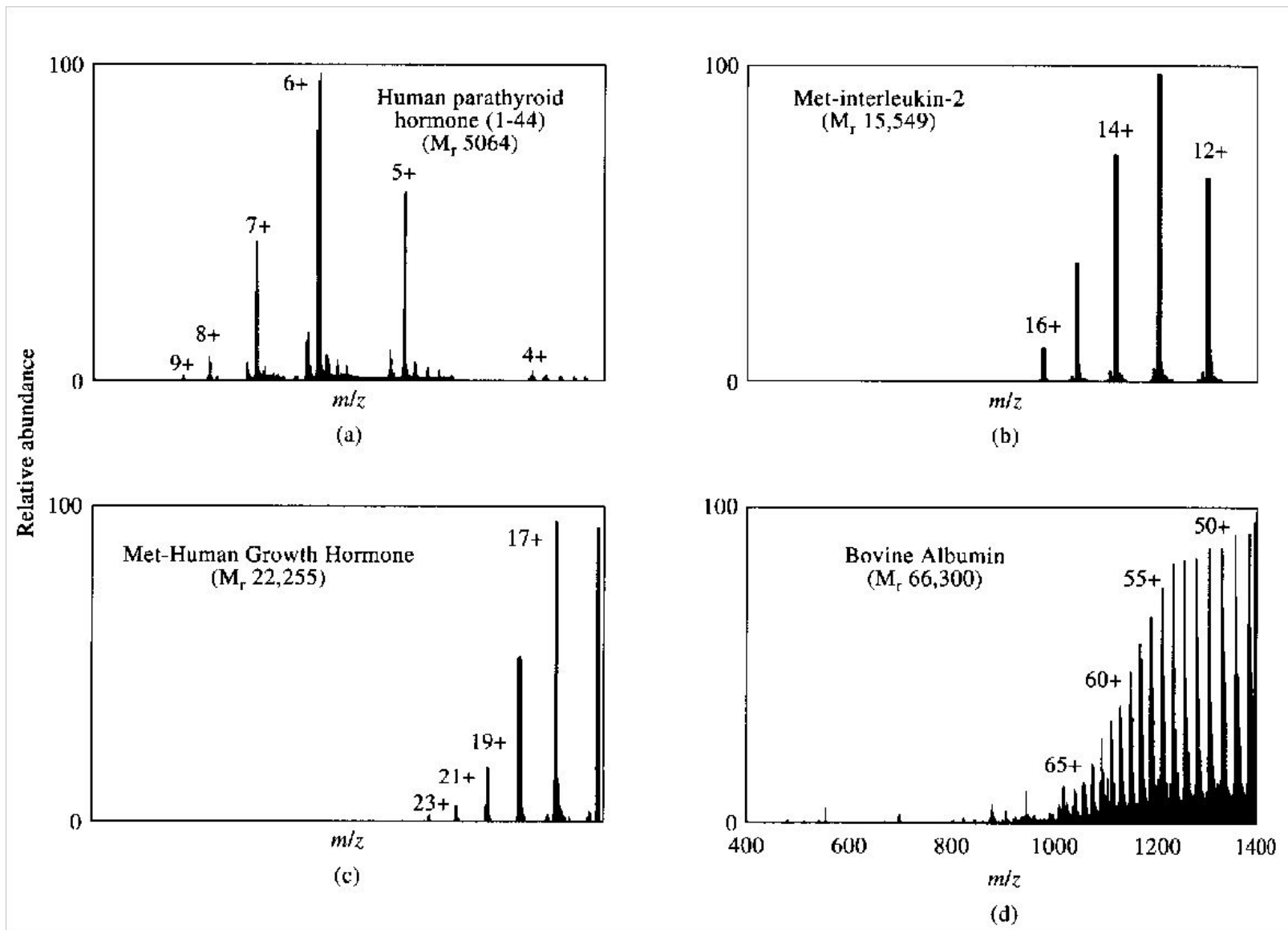
Electrospray Ionization Source



ELCTROSPRAY IONIZATION DETAILS



Electrospray Ionization MS of Proteins and Peptides

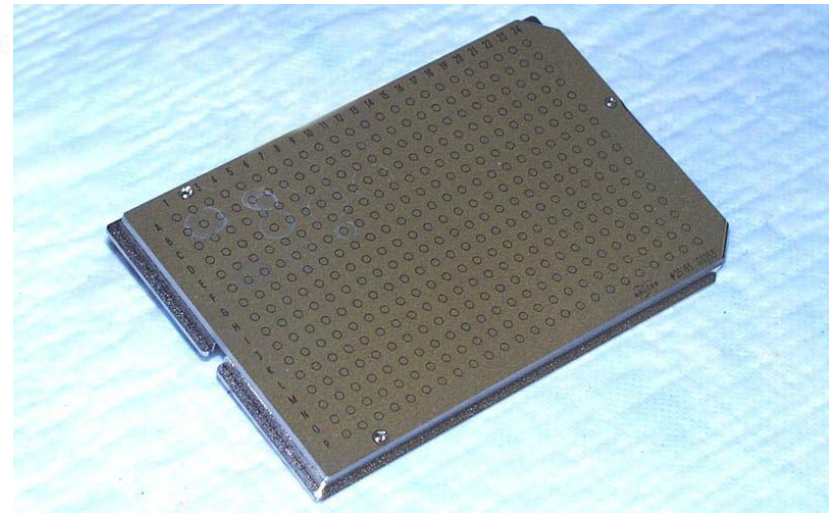
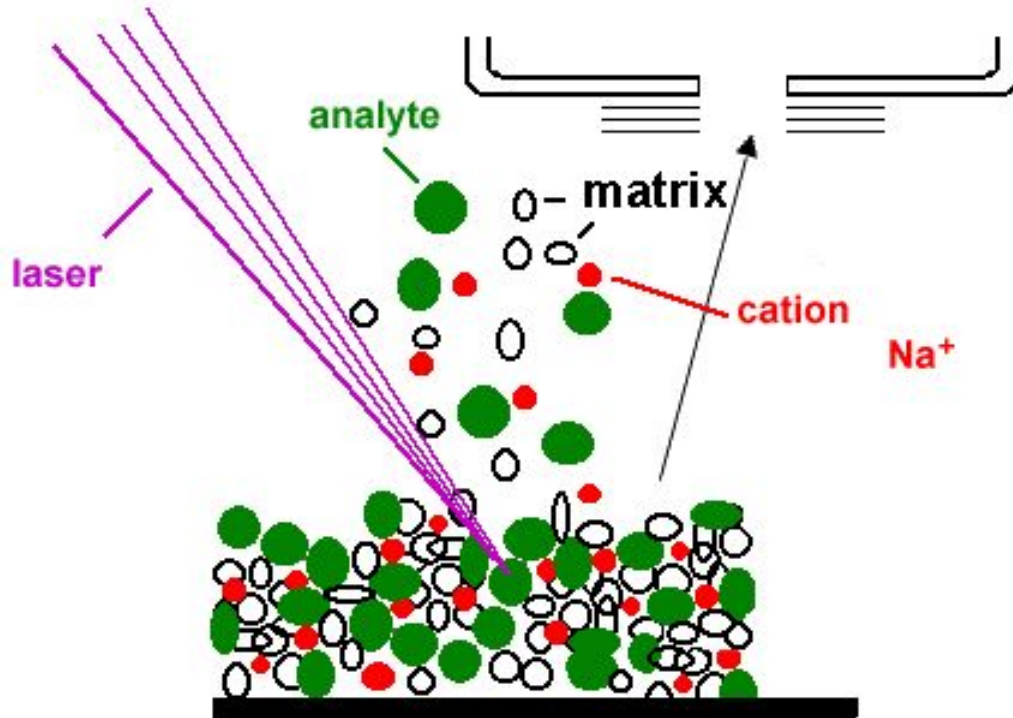


Источники ионов

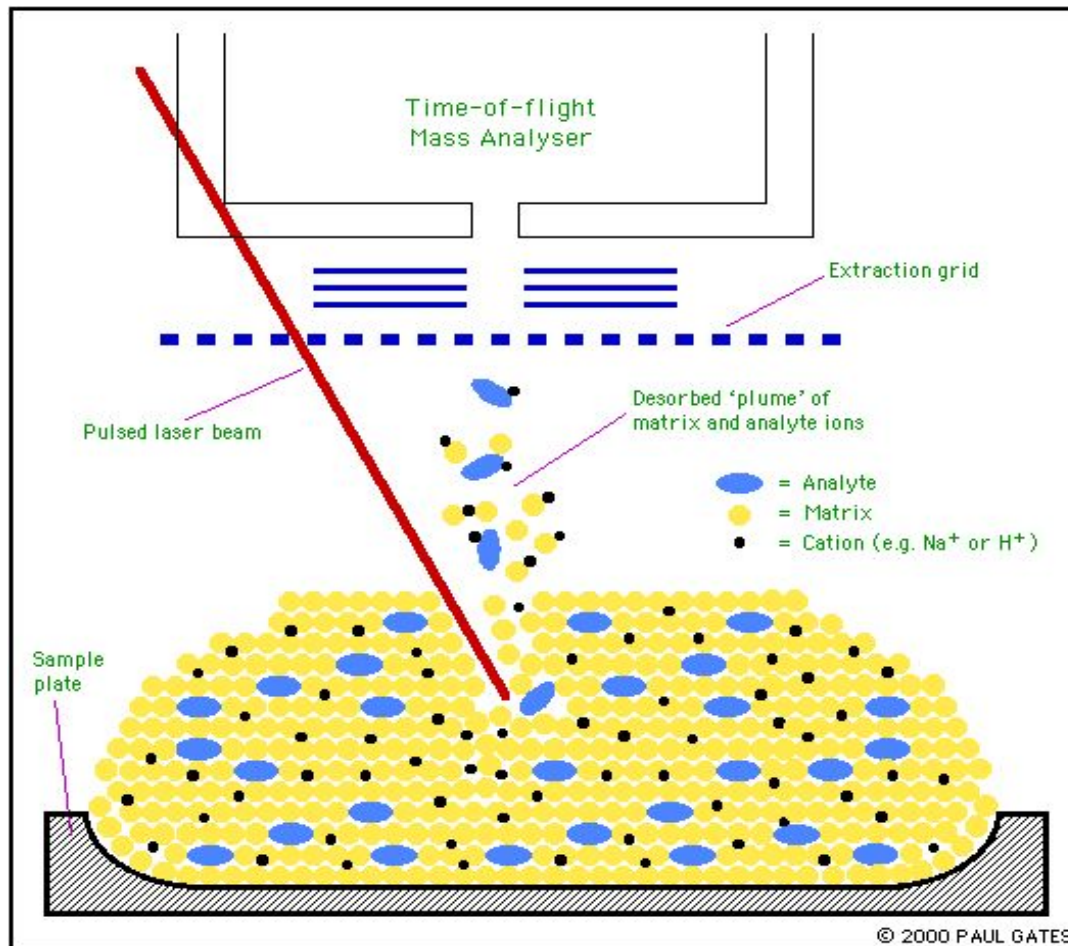
MALDI

MALDI - matrix assisted laser desorption / ionization

лазерная десорбция/ ионизация в присутствии вспомогательного вещества - матрицы



MALDI



Solid Matrix Materials for MALDI

TABLE 20-4 Matrices Most Frequently Used for MALDI Together with the Usable Wavelengths*

Matrix	Wavelength (nm)
Nicotinic acid	266, 220–290
Benzoic acid derivatives:	
2,5-Dihydroxybenzoic acid	266, 337, 355
Vanillic acid	266
2-Amino-benzoic acid	266, 337, 355
Pyrazine-carboxylic acid	266
3-Aminopyrazine-2-carboxylic acid	337
Cinnamic acid derivatives:	
Ferulic acid	266, 377, 355
Sinapinic acid	266, 337, 355
Caffeic acid	266, 337, 355
3-Nitrobenzylalcohol	266

*From M. Karas and U. Bahr, *Trends Anal. Chem.*, 1990, 9, 322.

MALDI-TOF

