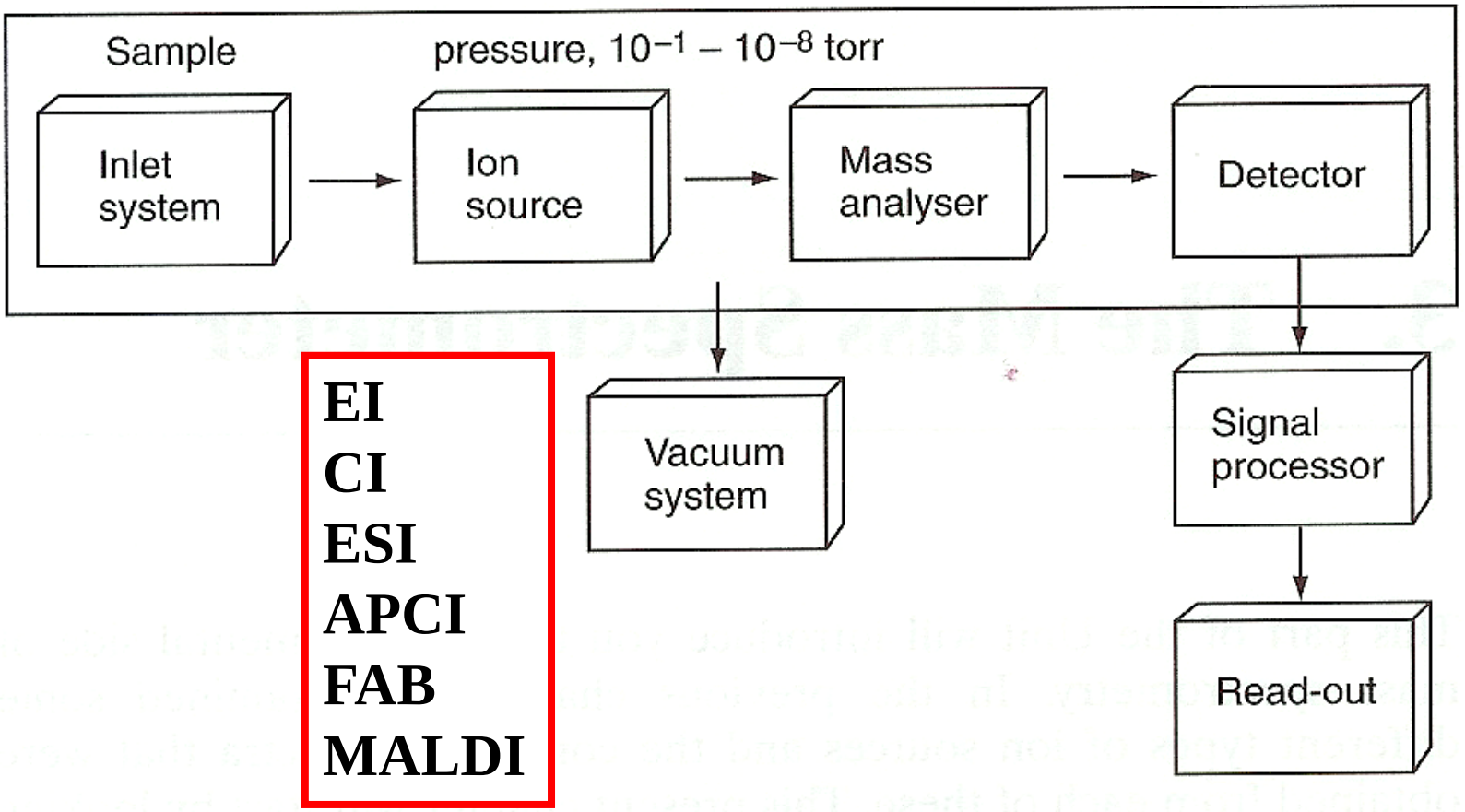
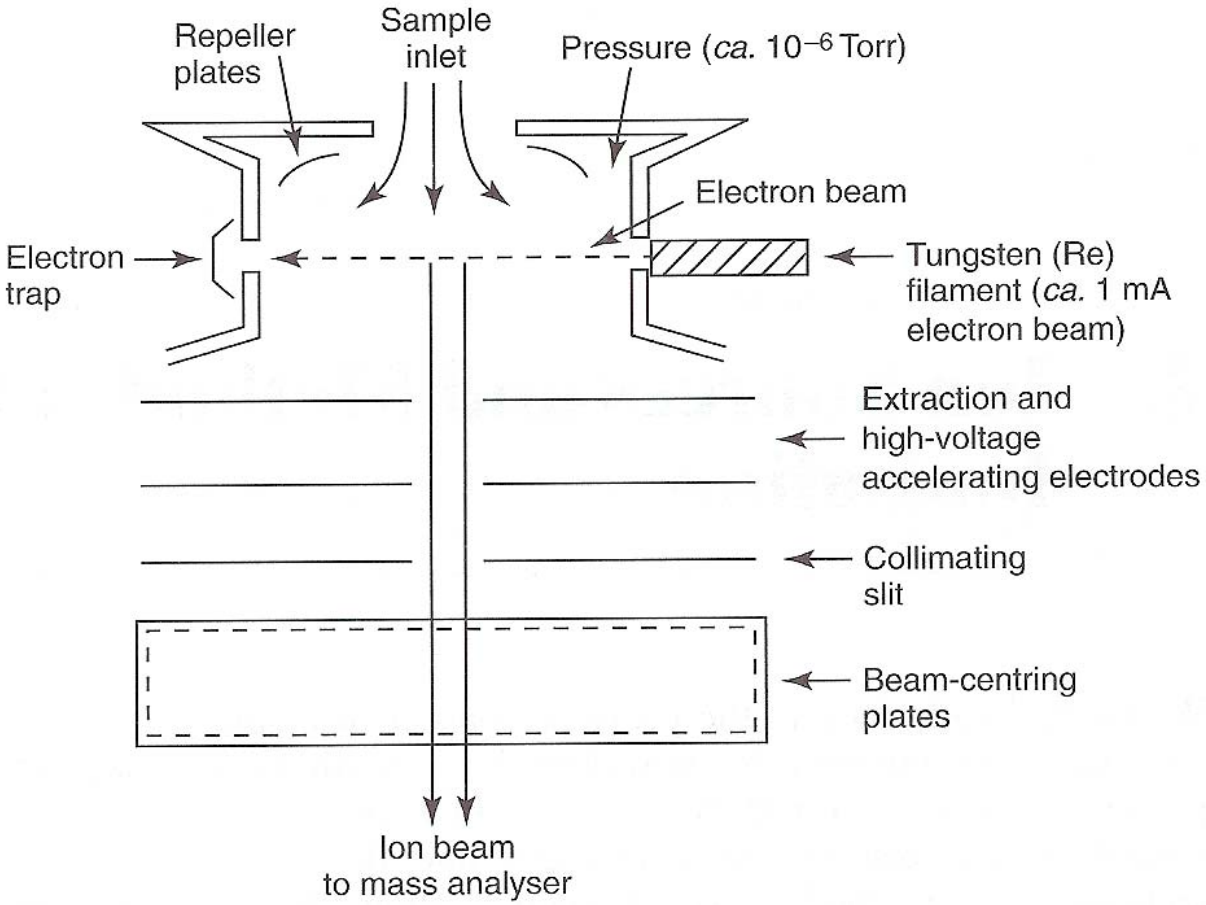
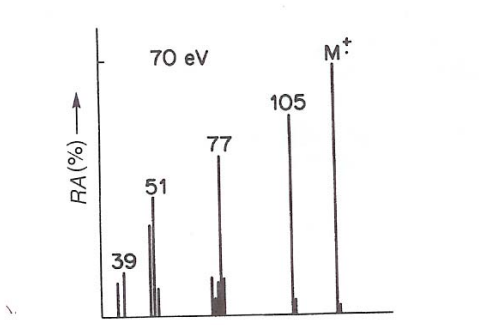


The components of a mass spectrometer

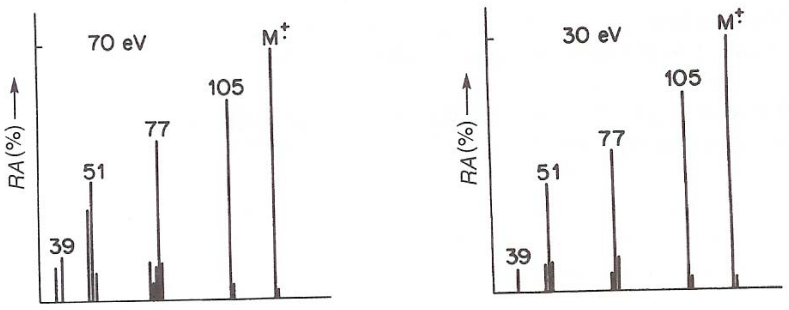
Ion Sources



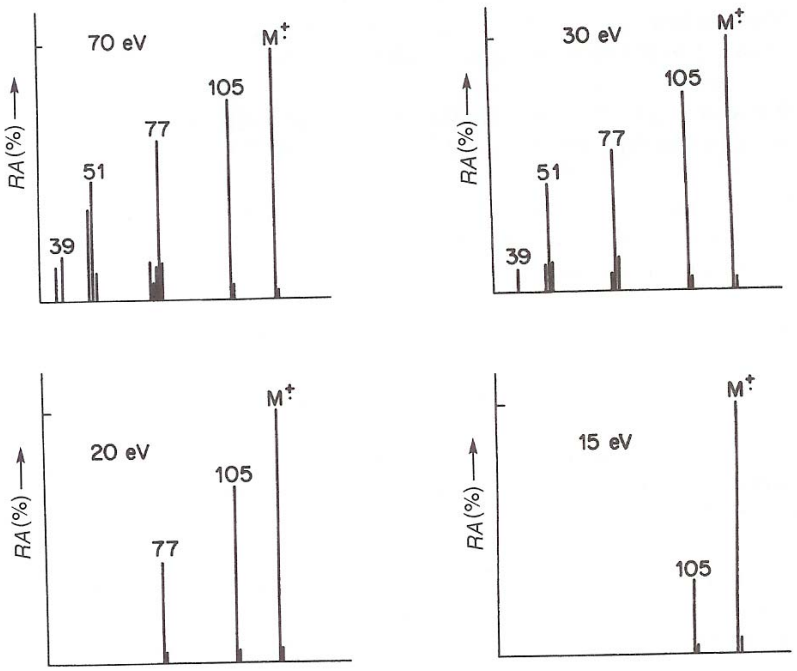
A schematic representation of an EI ion source



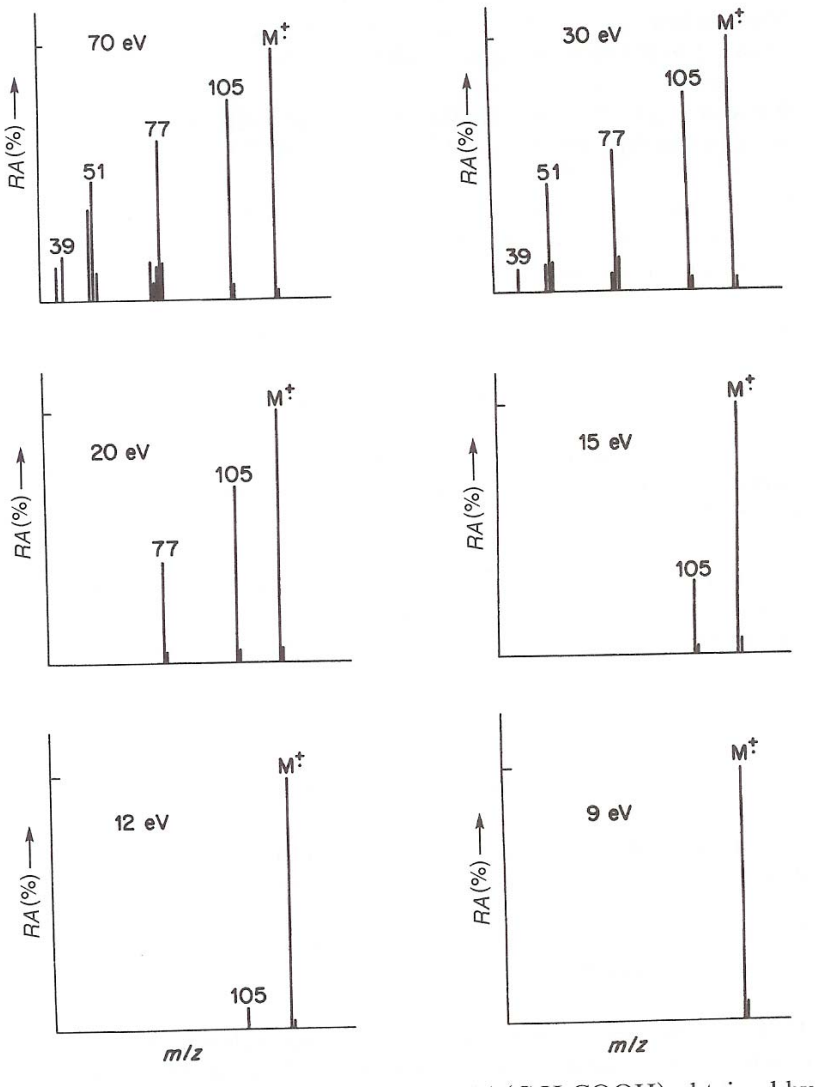
Mass spectra of benzoic acid obtained by using different beam energies



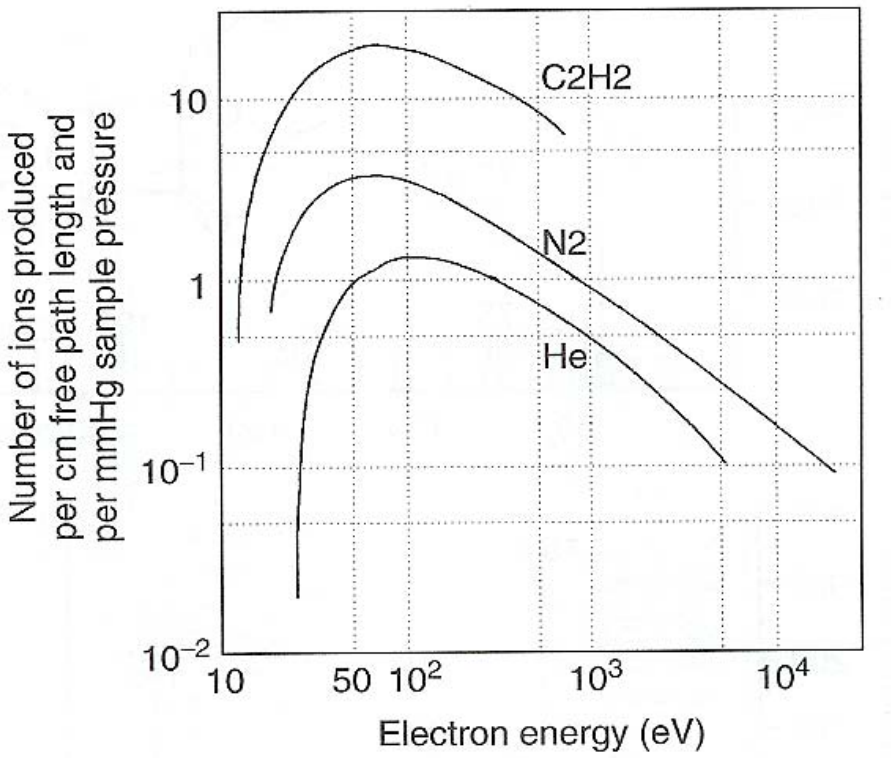
Mass spectra of benzoic acid obtained by using different beam energies



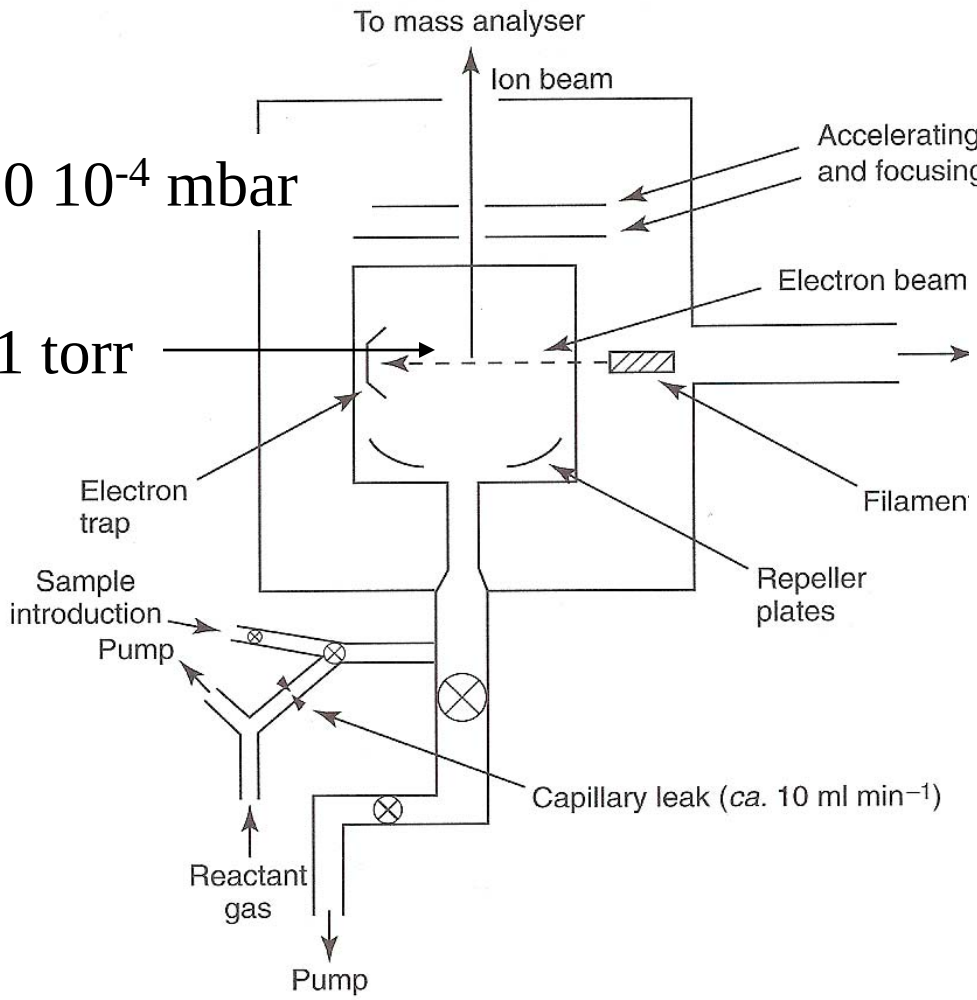
Mass spectra of benzoic acid obtained by using different beam energies



Mass spectra of benzoic acid obtained by using different beam energies



Number of ions produced as a function of the electron energy



1.0 10^{-4} mbar

~1 torr

$$CH_4 + e \rightarrow CH_4^{+*} + 2e$$

$$CH_4^{+\bullet} + CH_4 \rightarrow CH_5^+ + CH_3^\bullet$$

hypervalent carbon,

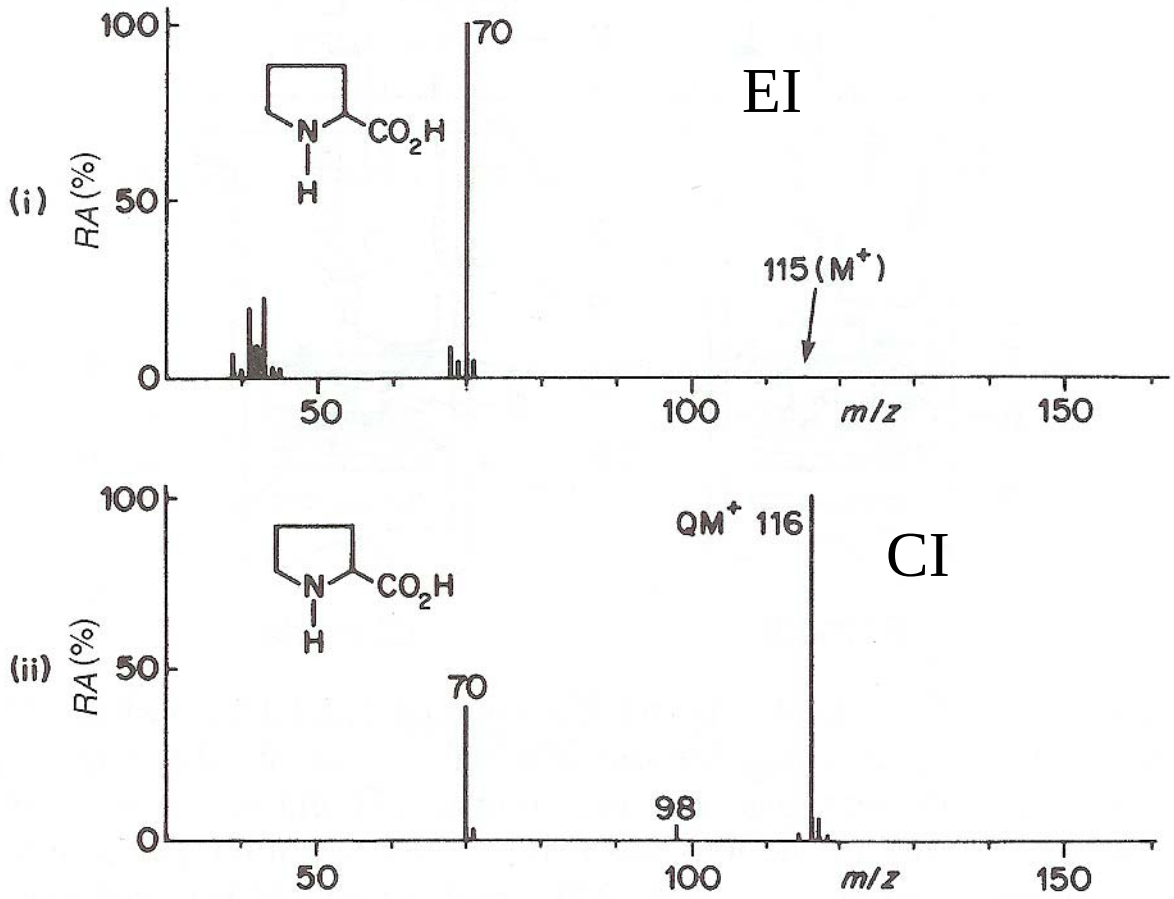
(exists in the gaseous phase, only)

$$CH_5^+ + M \rightarrow MH^+ + CH_4$$

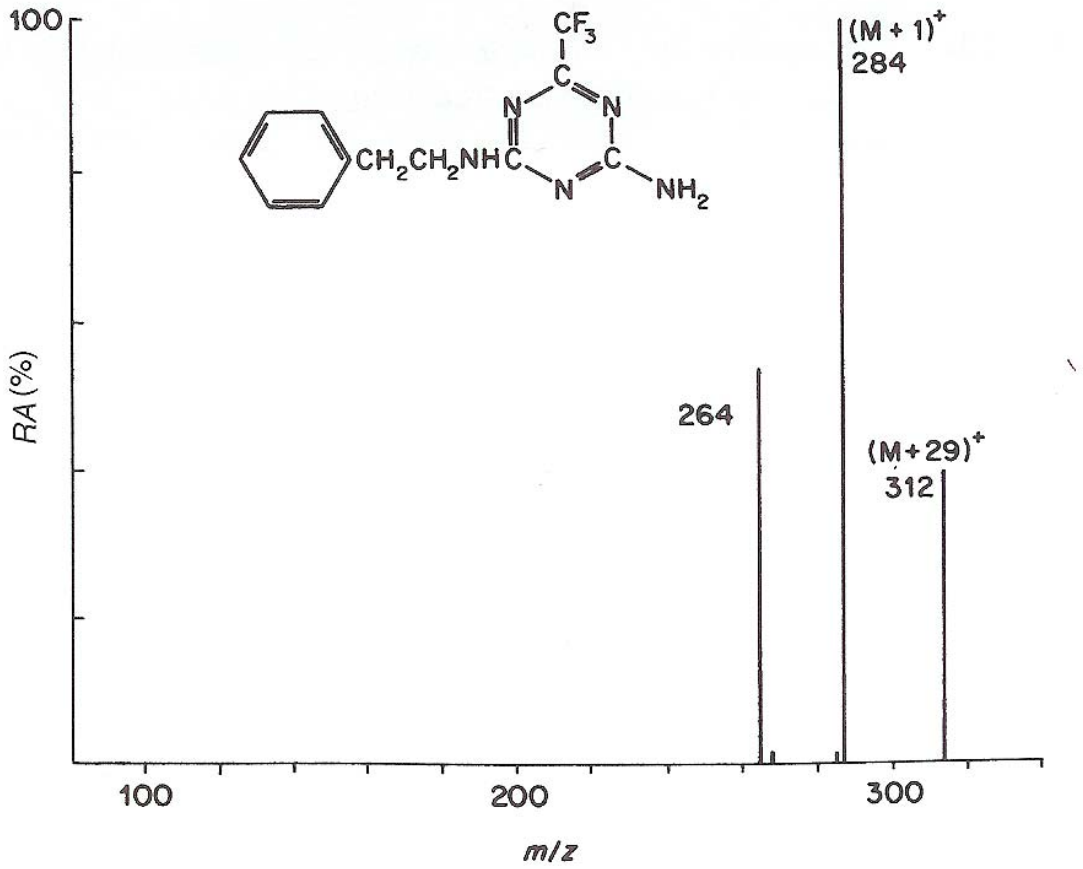
methane derived cluster formation

$$C_2H_5^+ \text{ or } C_3H_5^+$$

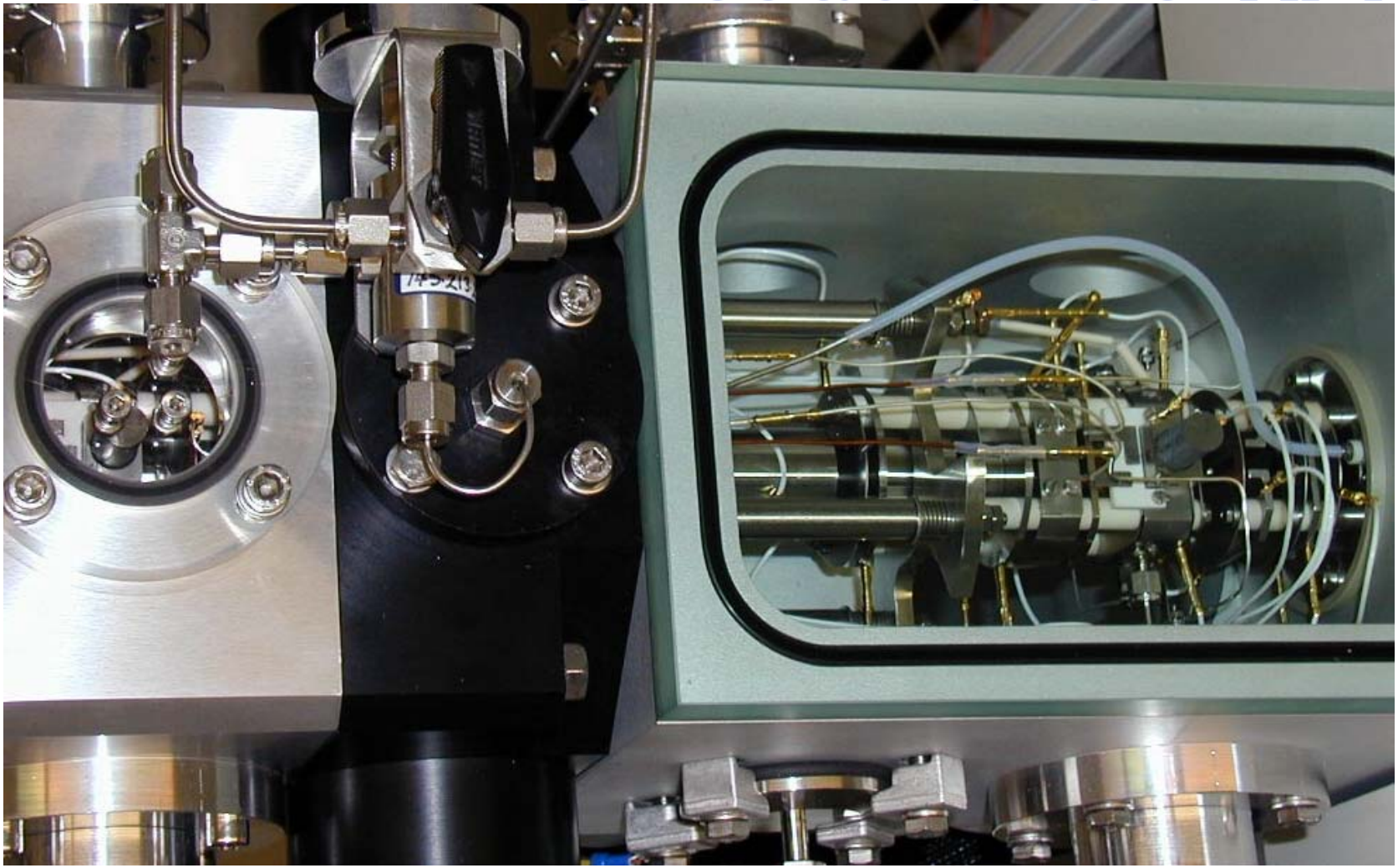
Schematic representation of a chemical-ionisation ion source



Mass spectra of proline: (i) = EI-; (ii) = CI-ionisation

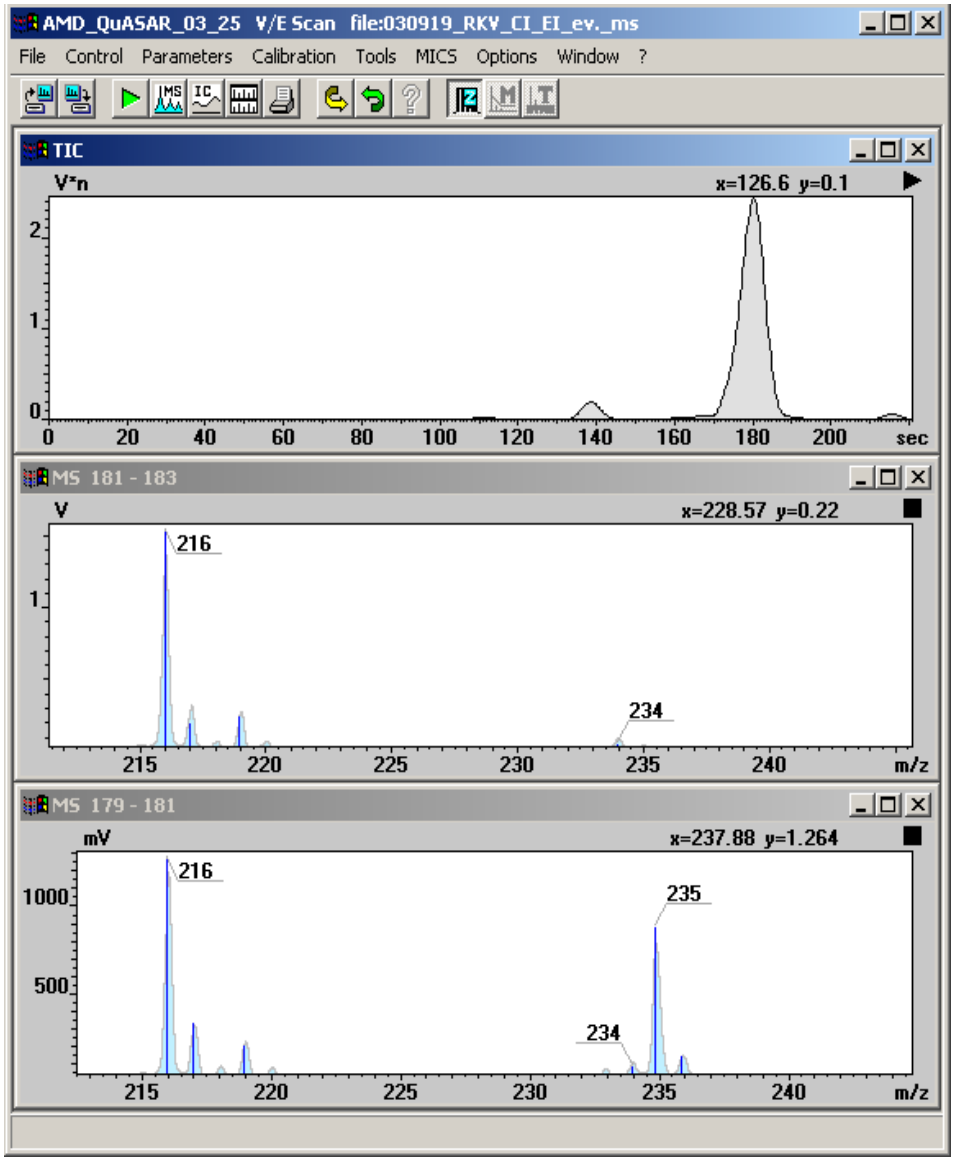


CI mass spectrum showing $(MH)^+$ and $(M+C_2H_5)^+$-ions

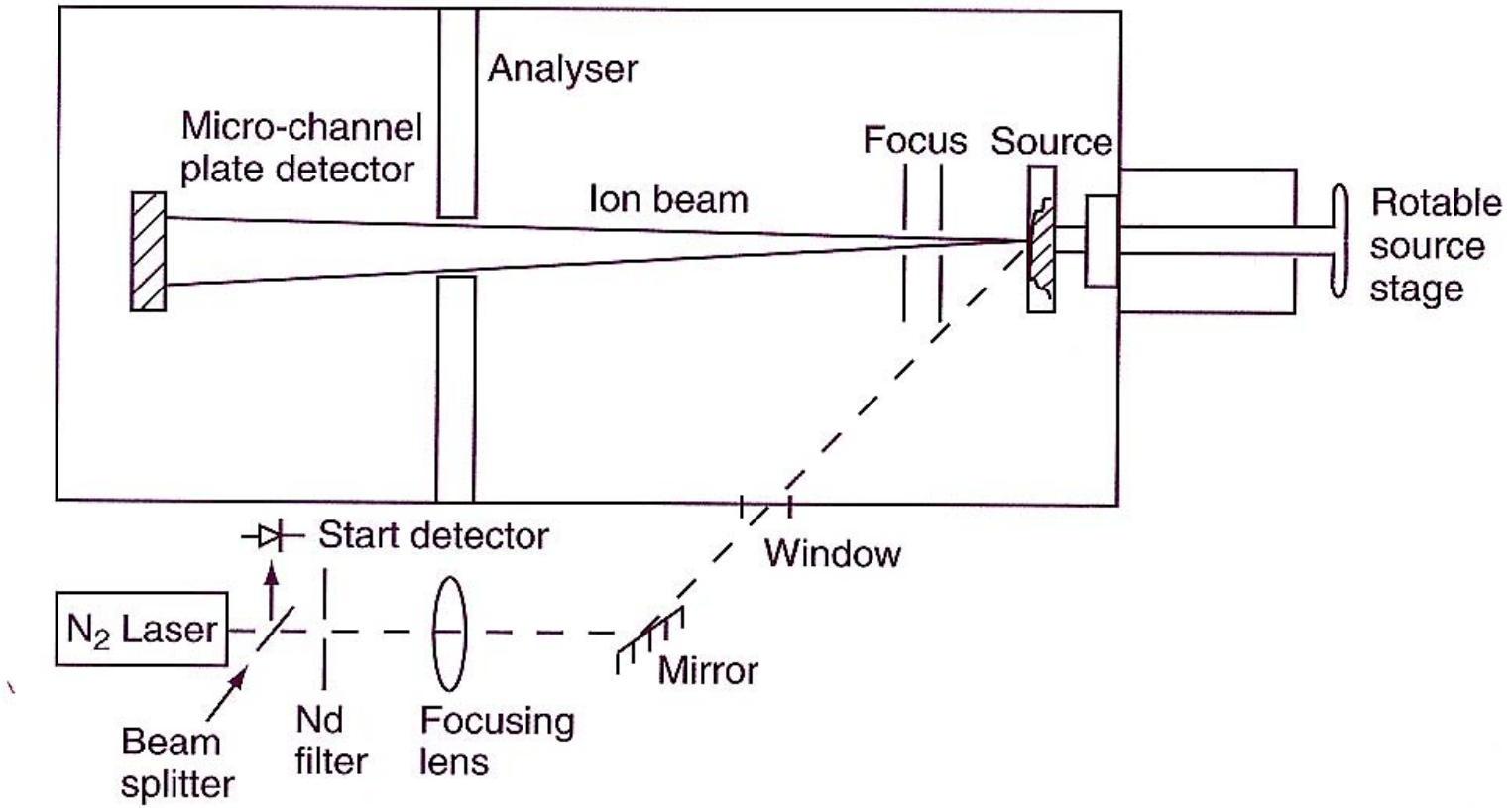


CI/EI **ion sources in** Unique Dual Ionization Configuration

Ion Sources



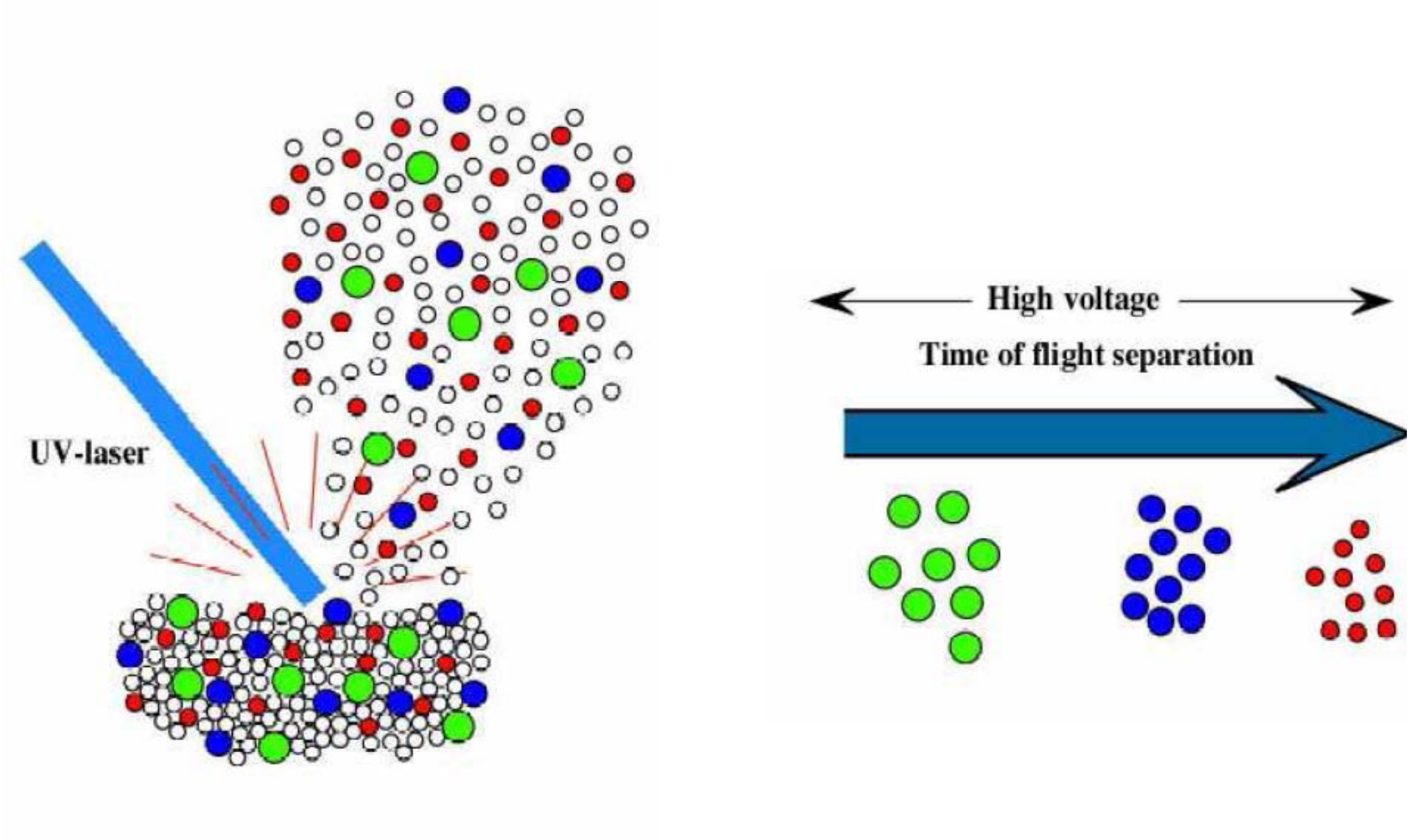
Partial **superimposed EI/CI** mass spectrum shown in the lower part of the figure.



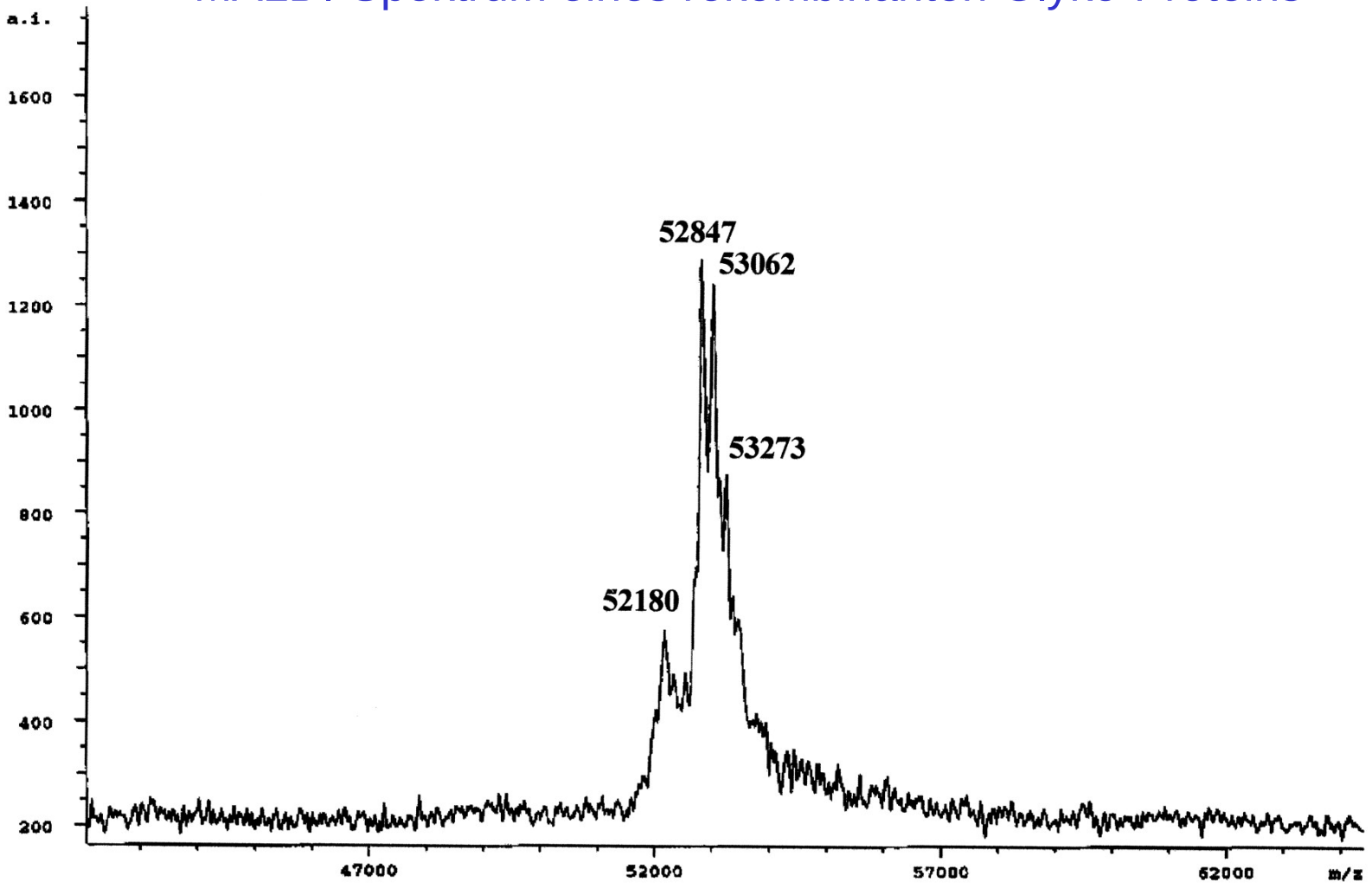
MALDI-TOF- Mass Spectrometer

Ion Sources

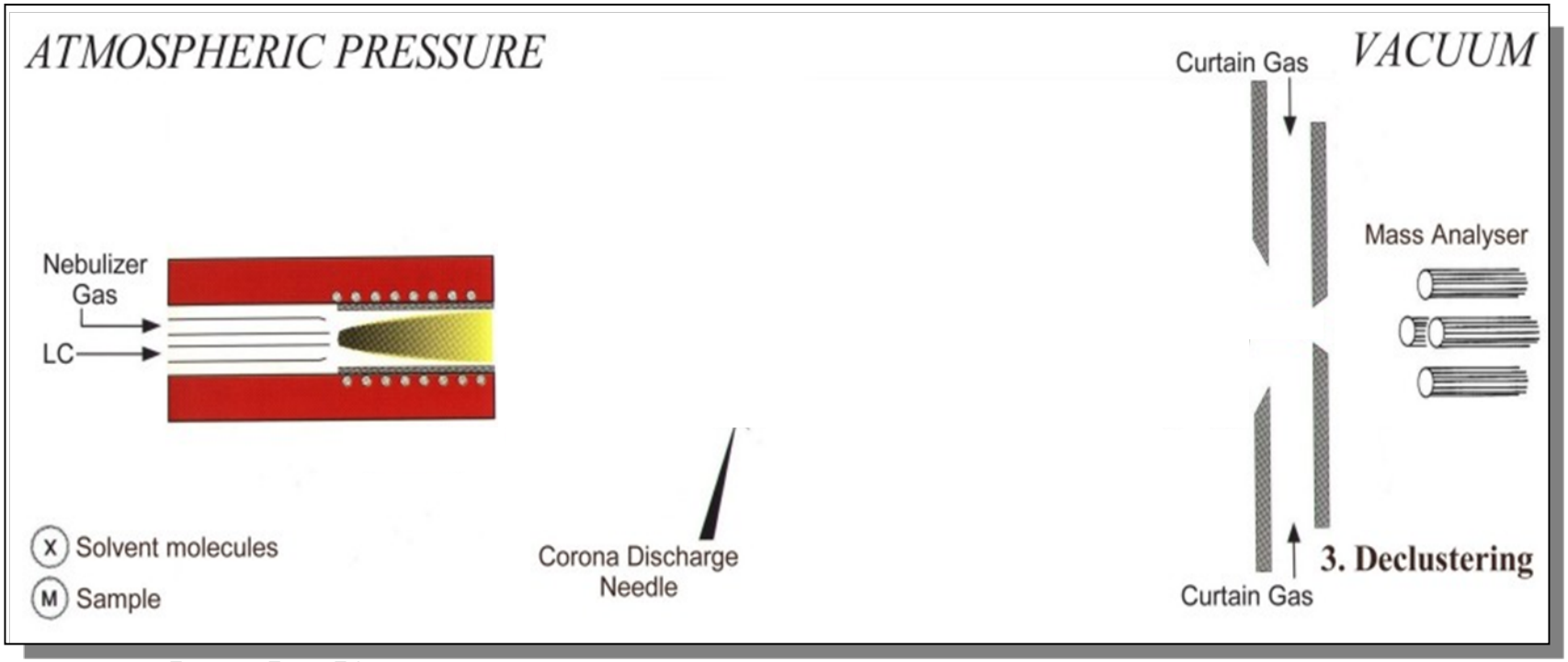
MALDI-TOF



MALDI-Spektrum eines rekombinanten Glyko-Proteins



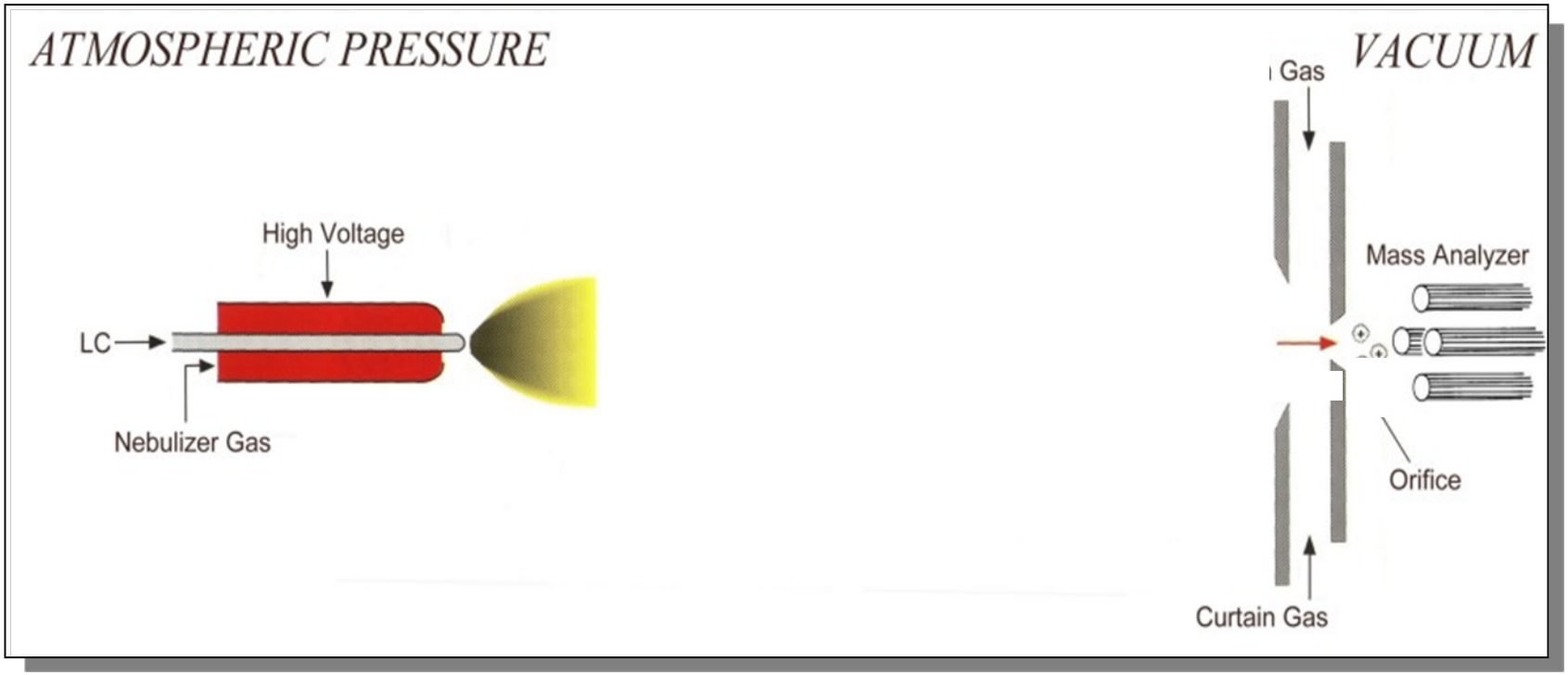
Heated Nebulizer (APCI)



Heated Nebulizer:

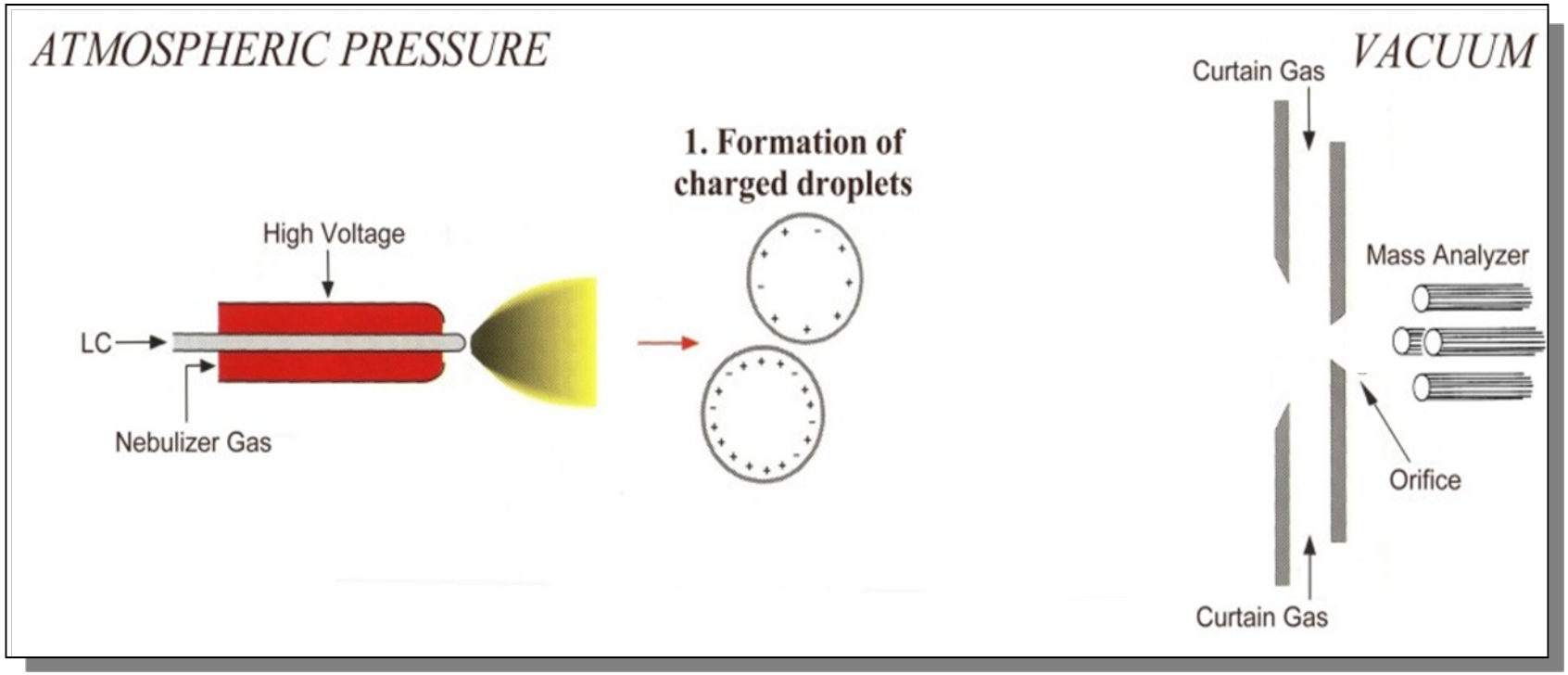
Atmospheric Pressure Chemical Ionisation (APCI)
corona discharge needle
polar to unpolar and thermally stable compounds

Ion Spray (ESI)



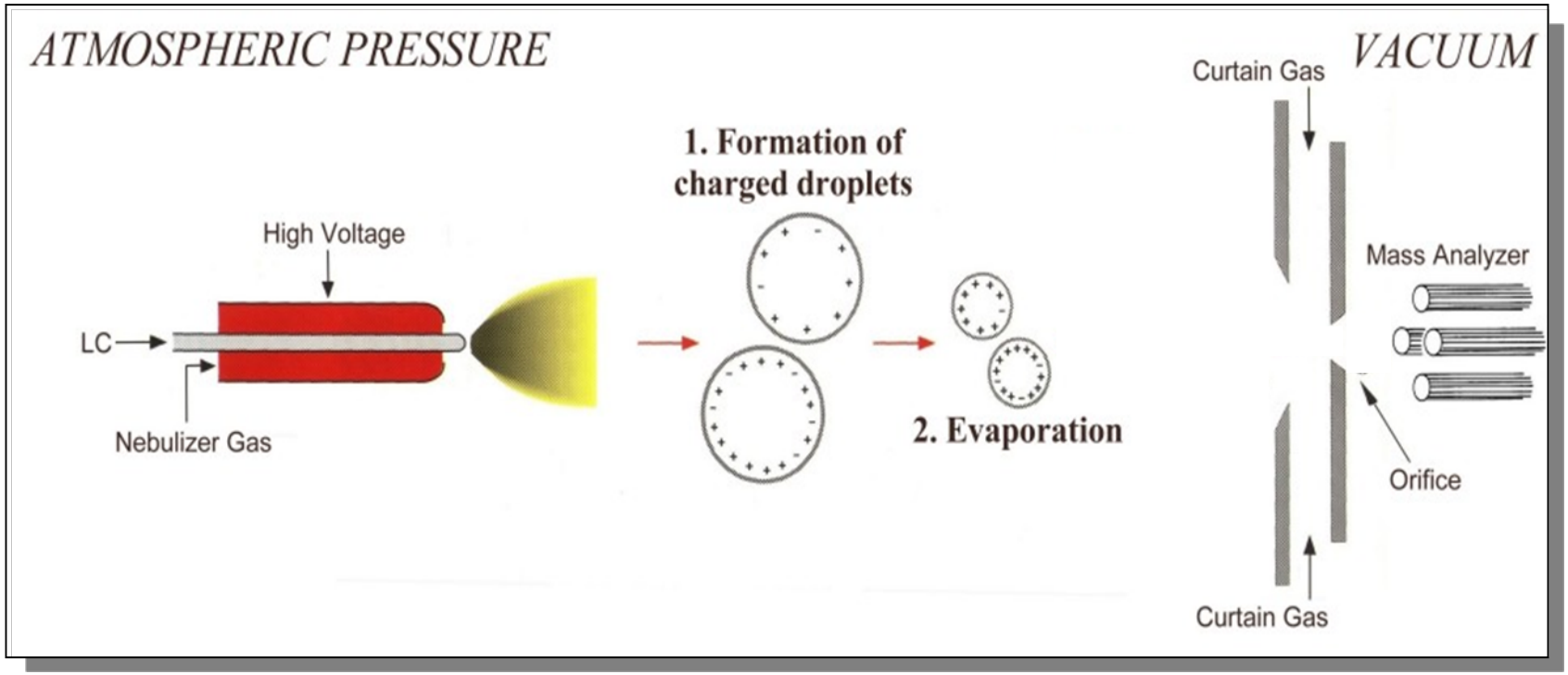
Ion Spray: Electrospray Ionisation (ESI)
softest ionisation technique
polar to ionic substances

Ion Spray (ESI)



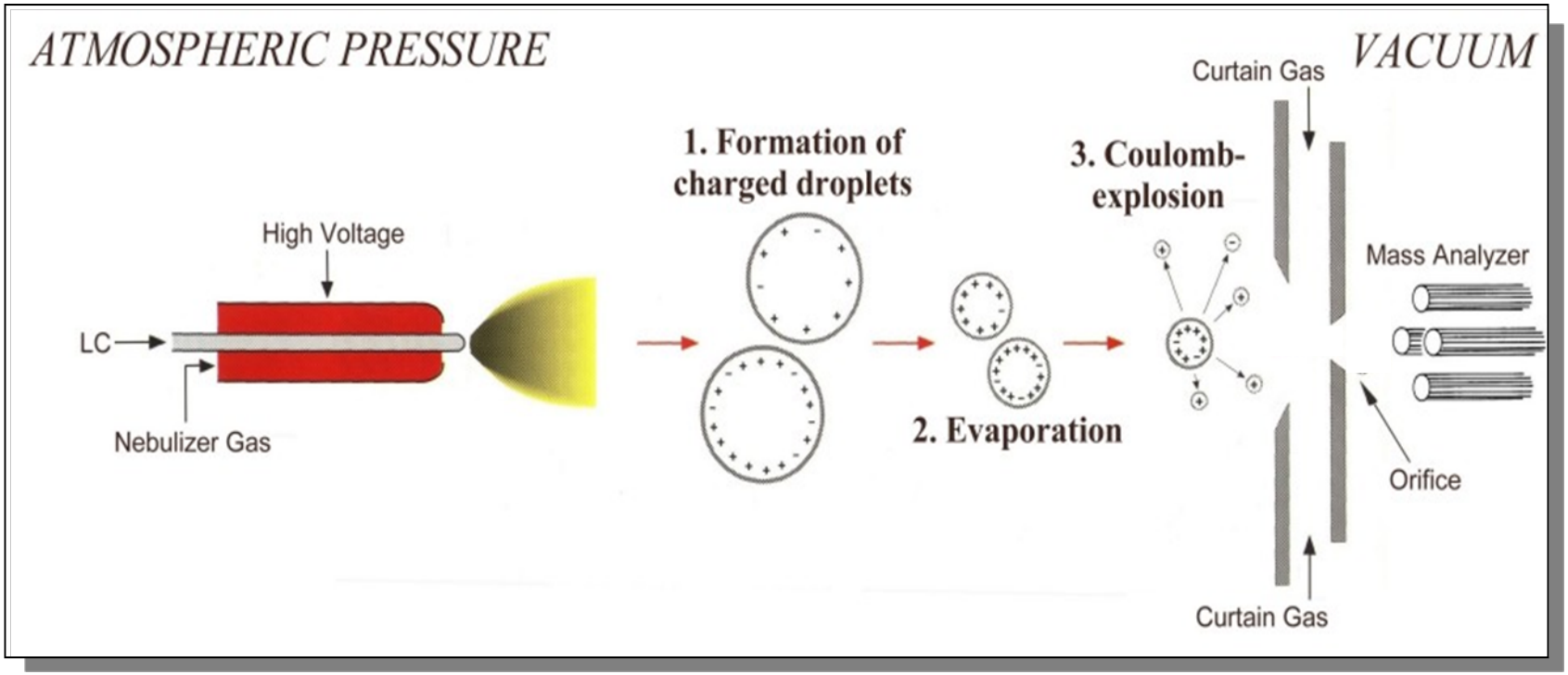
Ion Spray: Electrospray Ionisation (ESI)
softest ionisation technique
polar to ionic substances

Ion Spray (ESI)



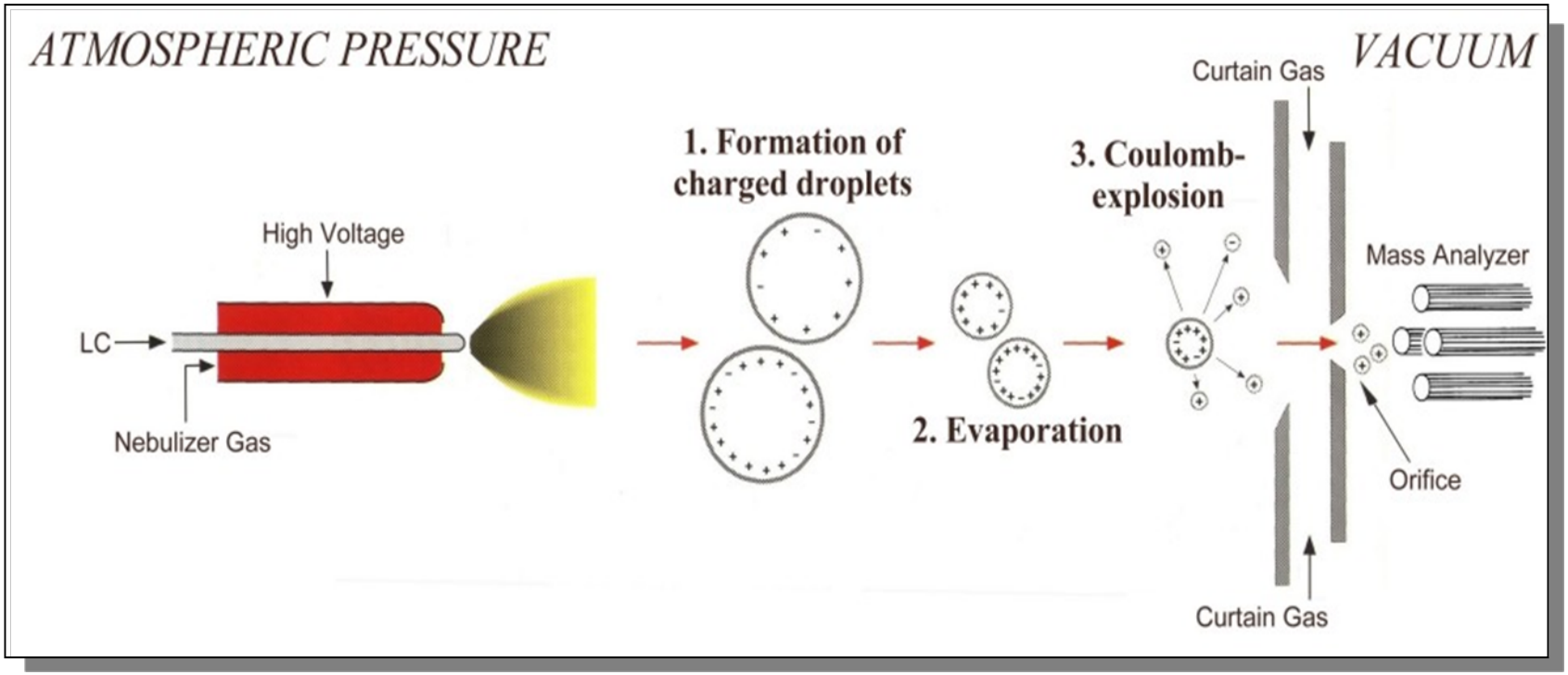
Ion Spray: Electrospray Ionisation (ESI)
softest ionisation technique
polar to ionic substances

Ion Spray (ESI)



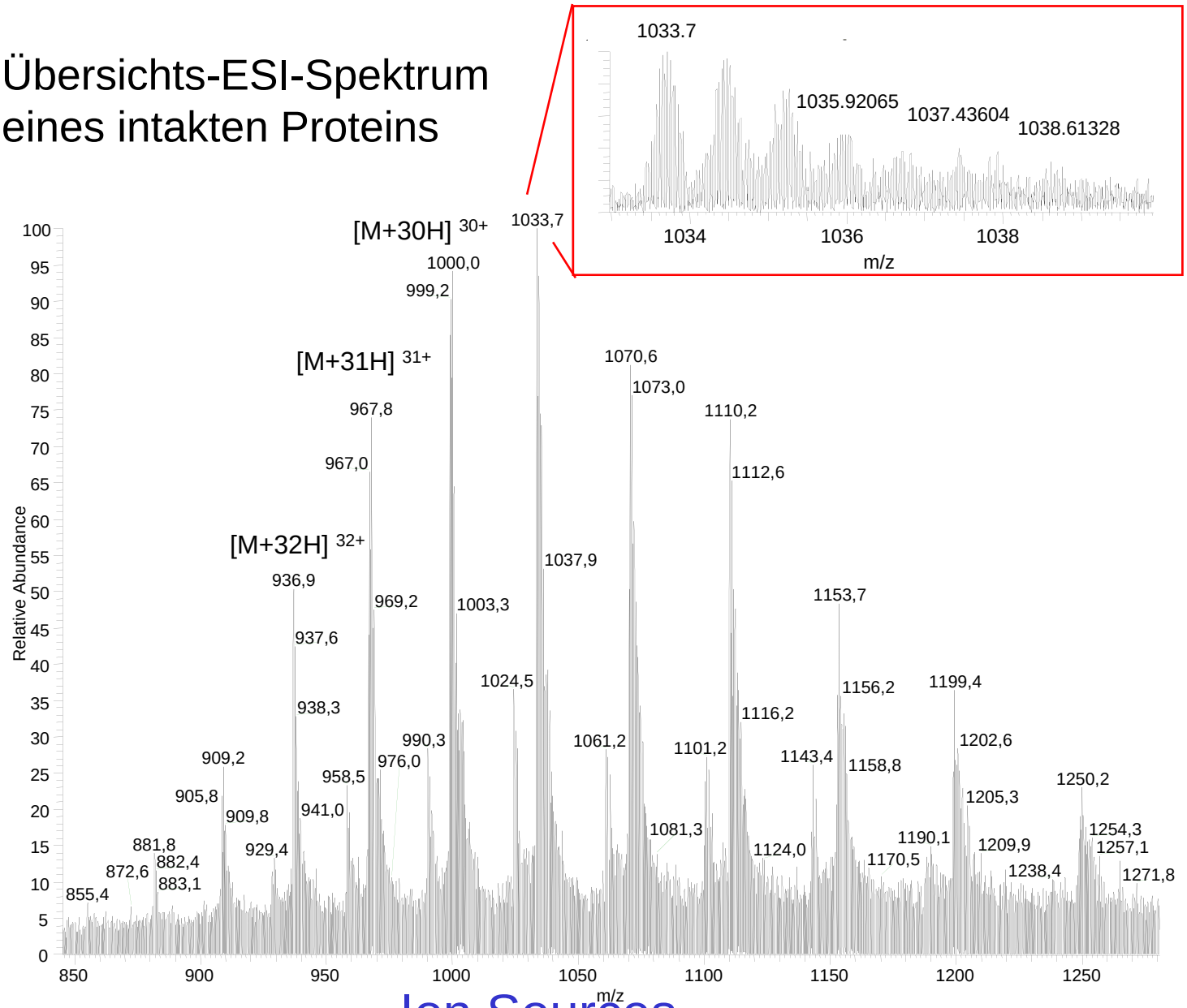
Ion Spray: Electrospray Ionisation (ESI)
softest ionisation technique
polar to ionic substances

Ion Spray (ESI)



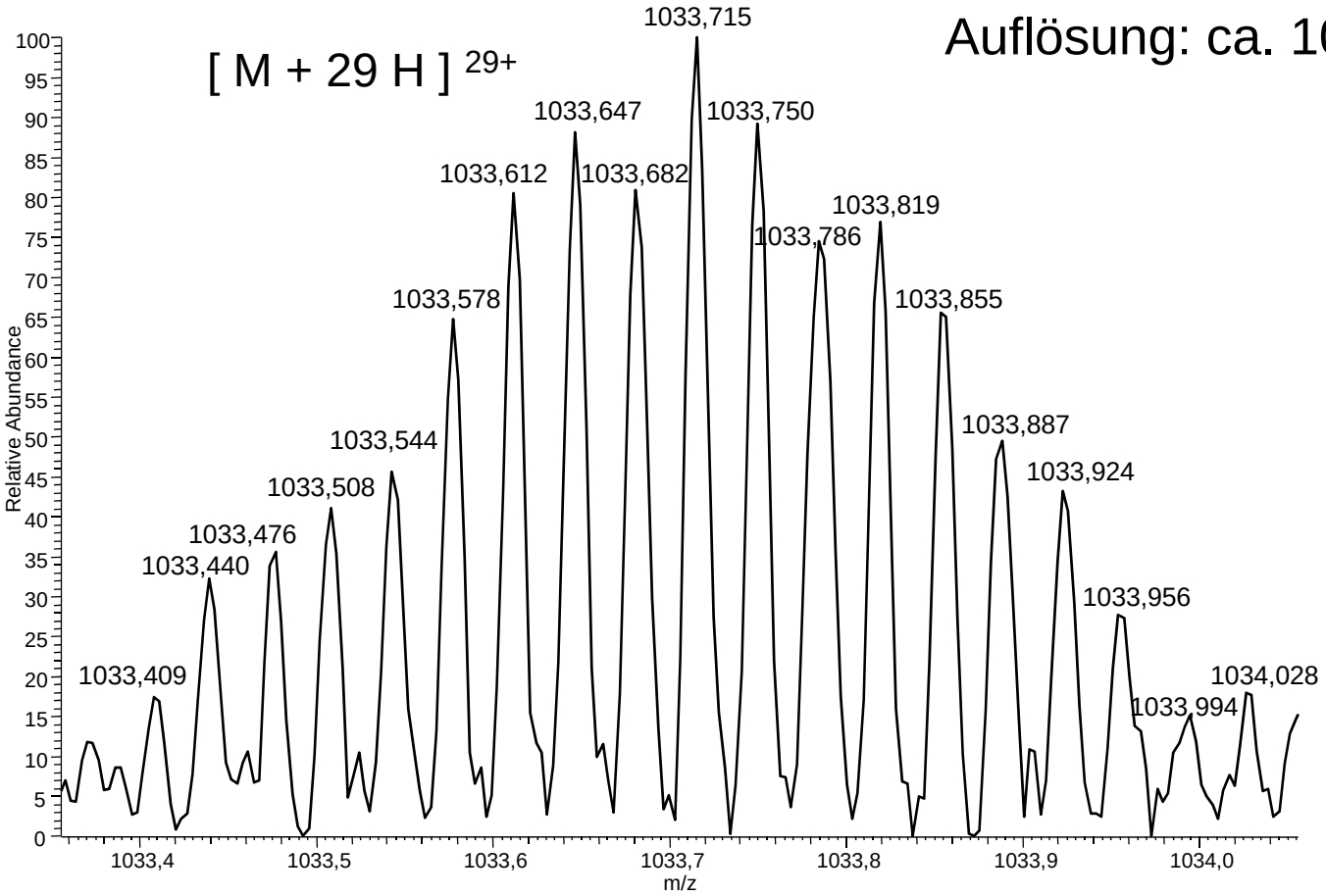
Ion Spray: Electrospray Ionisation (ESI)
softest ionisation technique
polar to ionic substances

Übersichts-ESI-Spektrum eines intakten Proteins

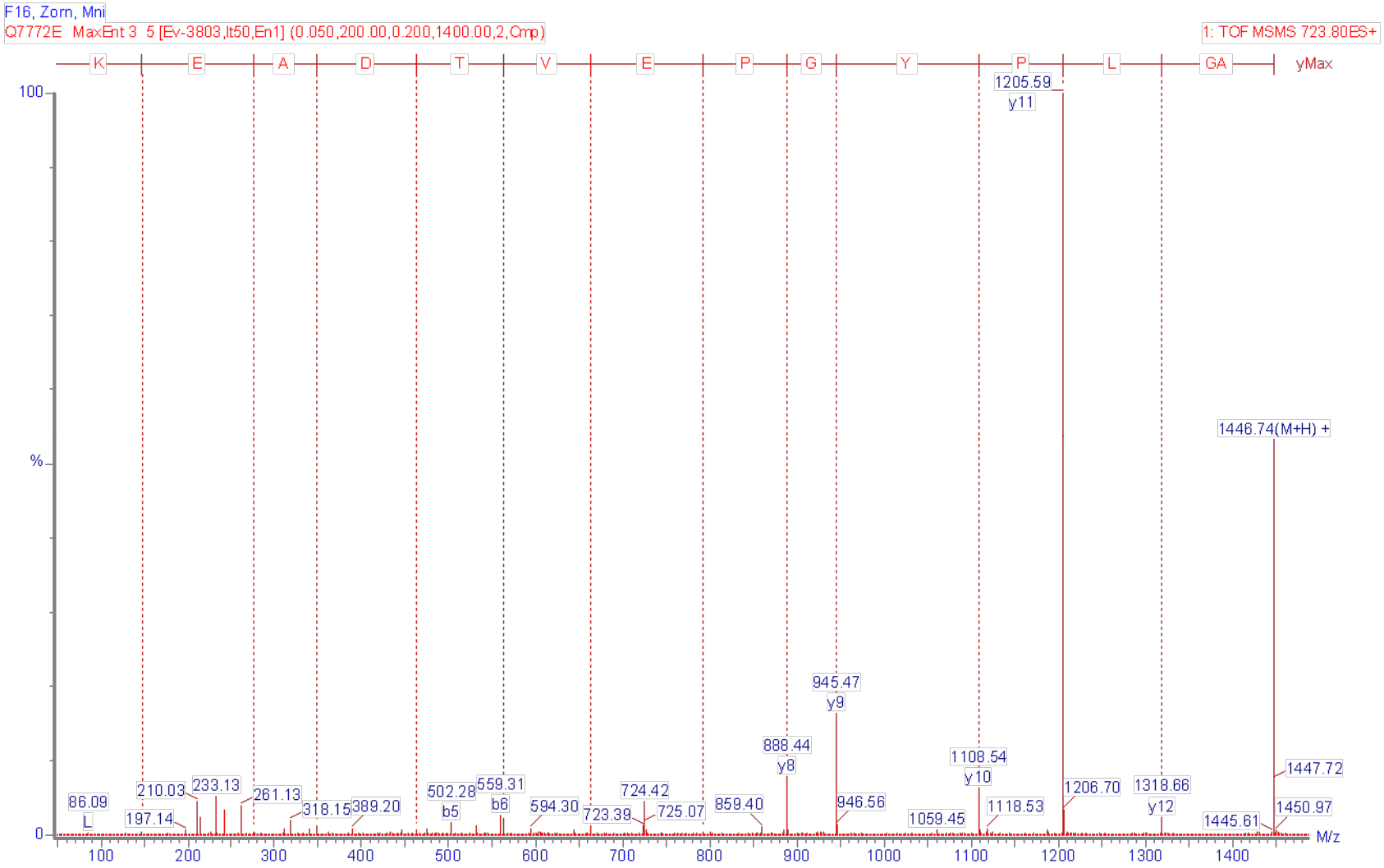


$C_{1332}H_{2121}N_{359}O_{414}$

$M_{theor.}$: 29930.45 $M_{gemessen}$: 29930.48



Ion Sources


F16, Zorn, Mni
Q7772E MaxEnt 3 5 [Ev-3803,It50,En1] (0.050,200.00,0.200,1400.00,2,Cmp)
1: TOF MSMS 723.80ES+
K E A D T V E P G Y P L GA
yMax
100
%
0
1205.59
y11
1446.74(M+H) +
945.47
y9
888.44
y8
1108.54
y10
1447.72
1206.70
1318.66
y12
1450.97
1445.61
1118.53
1059.45
946.56
859.40
724.42
725.07
723.39
594.30
559.31
b6
502.28
b5
389.20
318.15
261.13
233.13
210.03
197.14
86.09
L
M/z
100 200 300 400 500 600 700 800 900 1000 1100 1200 1300 1400

Ion Sources

Ala-NH_3

N-Terminus

b	72.0	**129.1**	**242.2**	339.2	**502.3**	**559.3**	656.3	785.4	884.5	985.5	1100.5	1171.6	1300.6	-
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	Ala	**Gly**	**Leu**	**Pro**	**Tyr**	**Gly**	**Pro**	**Glu**	**Val**	**Thr**	**Asp**	**Ala**	**Glu**	**Lys**
	14	13	12	11	10	9	8	7	6	5	4	3	2	1
y''	-	1375.7	**1318.7**	**1205.6**	**1108.5**	**945.5**	**888.4**	**791.4**	**662.3**	**563.3**	**462.2**	**347.2**	**276.2**	**147.1**

C-Terminus

Blast search

The best scores are: UniRef100_P87212: **Peroxidase**

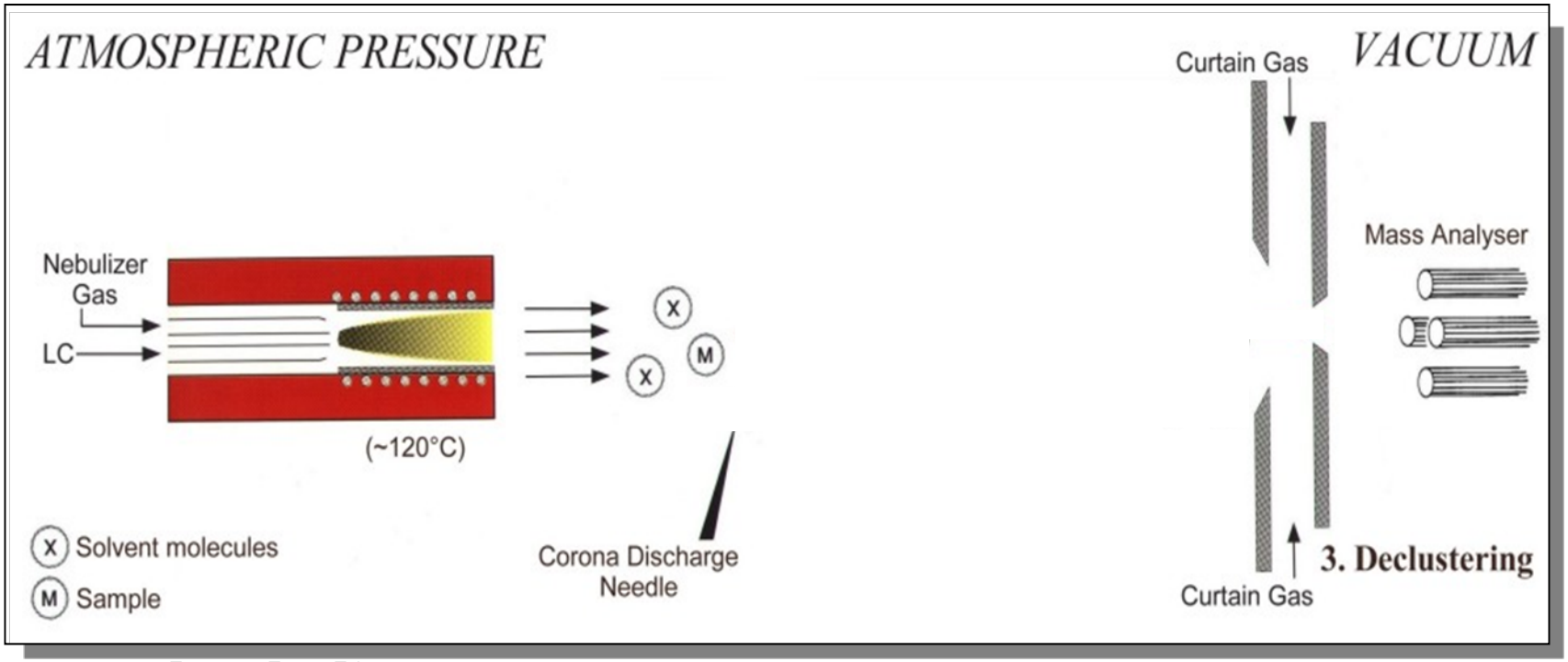
Sequenz **AGLPYGPEVTDAEK**

```
                                                  :: ::::::::::
UR100: RCPFTAHVRKTNPRDLEAQGLIPDLFHAIRAGTPYGPEVTDAESNSNTTSIDRGLAFVEY
       360        370        380        390        400        410
```

Danach:

1. Rückübersetzung der Peptidsequenz in genetischen Code
2. Bau einer Gensonde
3. Fischen des Zielgens
4. Ableiten der gesamten Aminosäuresequenz des Zielproteins
5. Heterologe Expression des Proteins etc. etc.

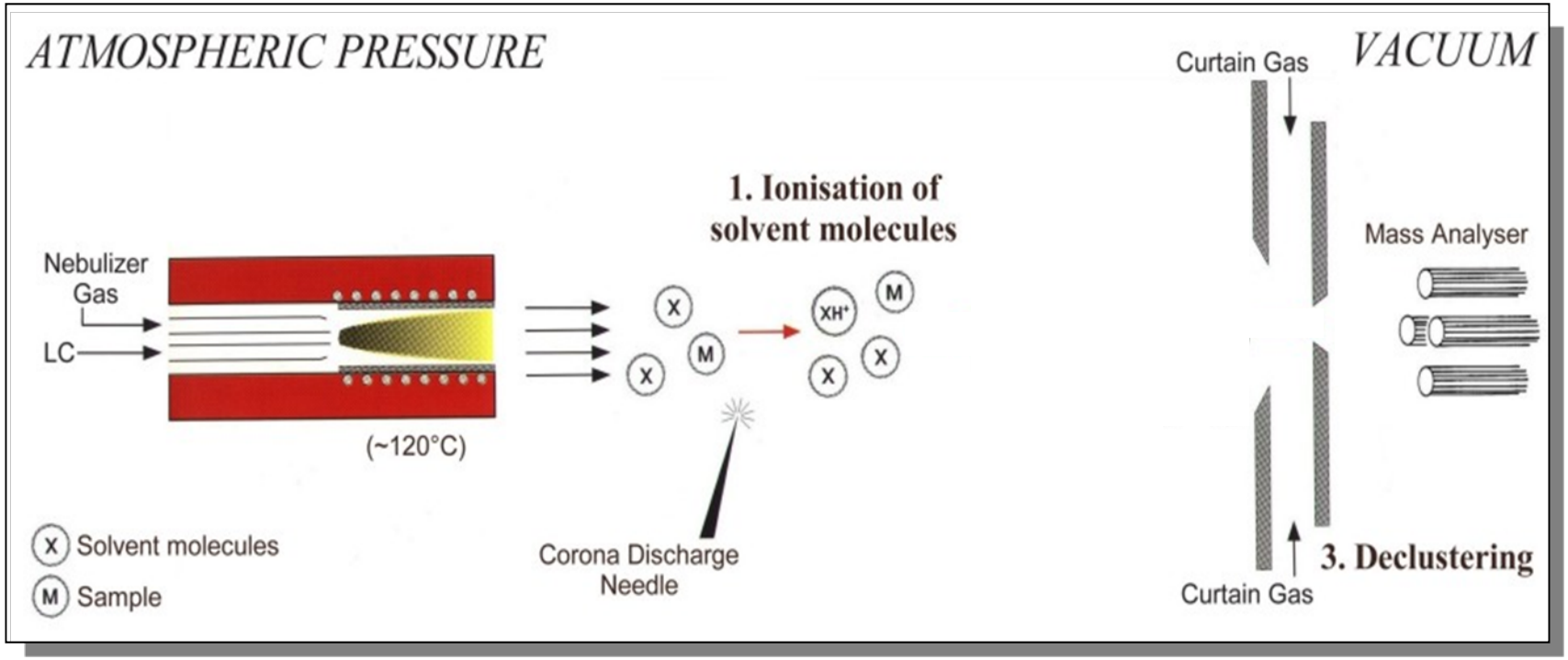
Heated Nebulizer (APCI)



Heated Nebulizer:

Atmospheric Pressure Chemical Ionisation (APCI)
corona discharge needle
polar to unpolar and thermally stable compounds

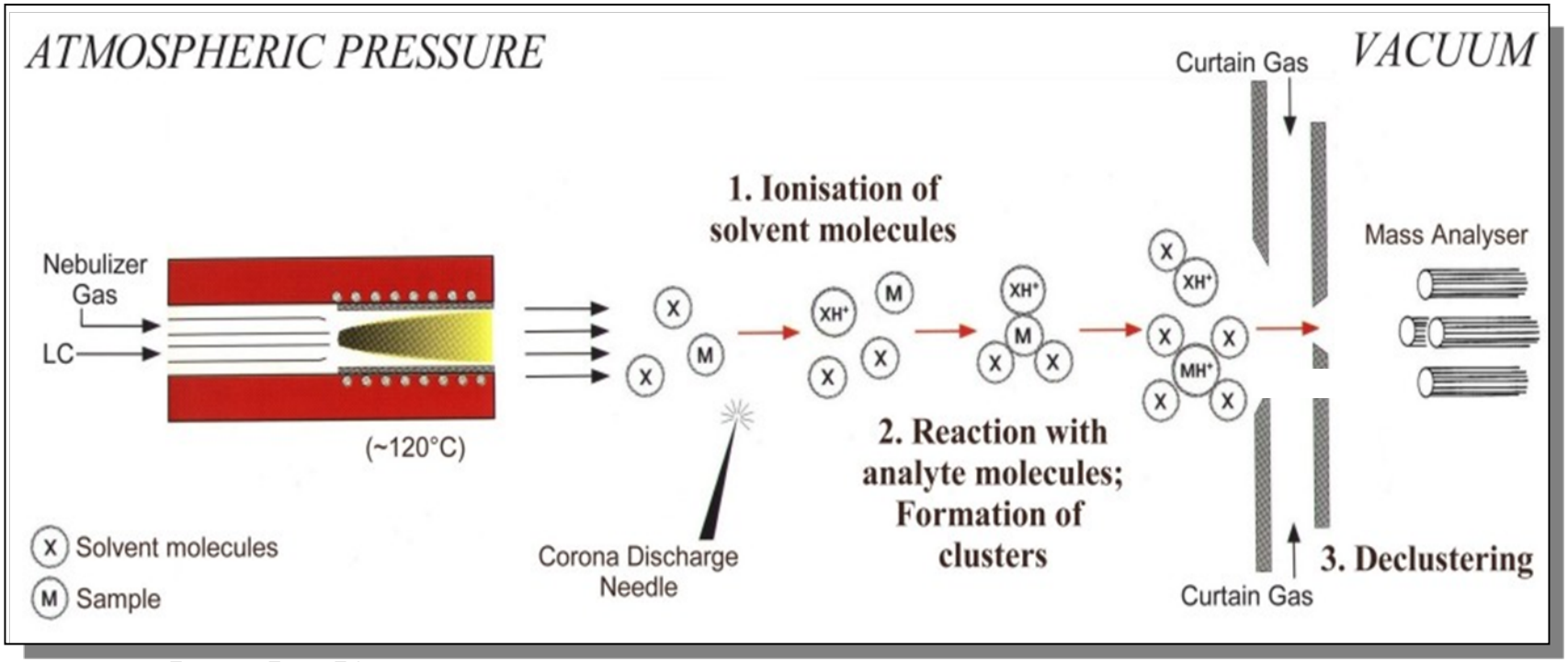
Heated Nebulizer (APCI)



Heated Nebulizer:

Atmospheric Pressure Chemical Ionisation (APCI)
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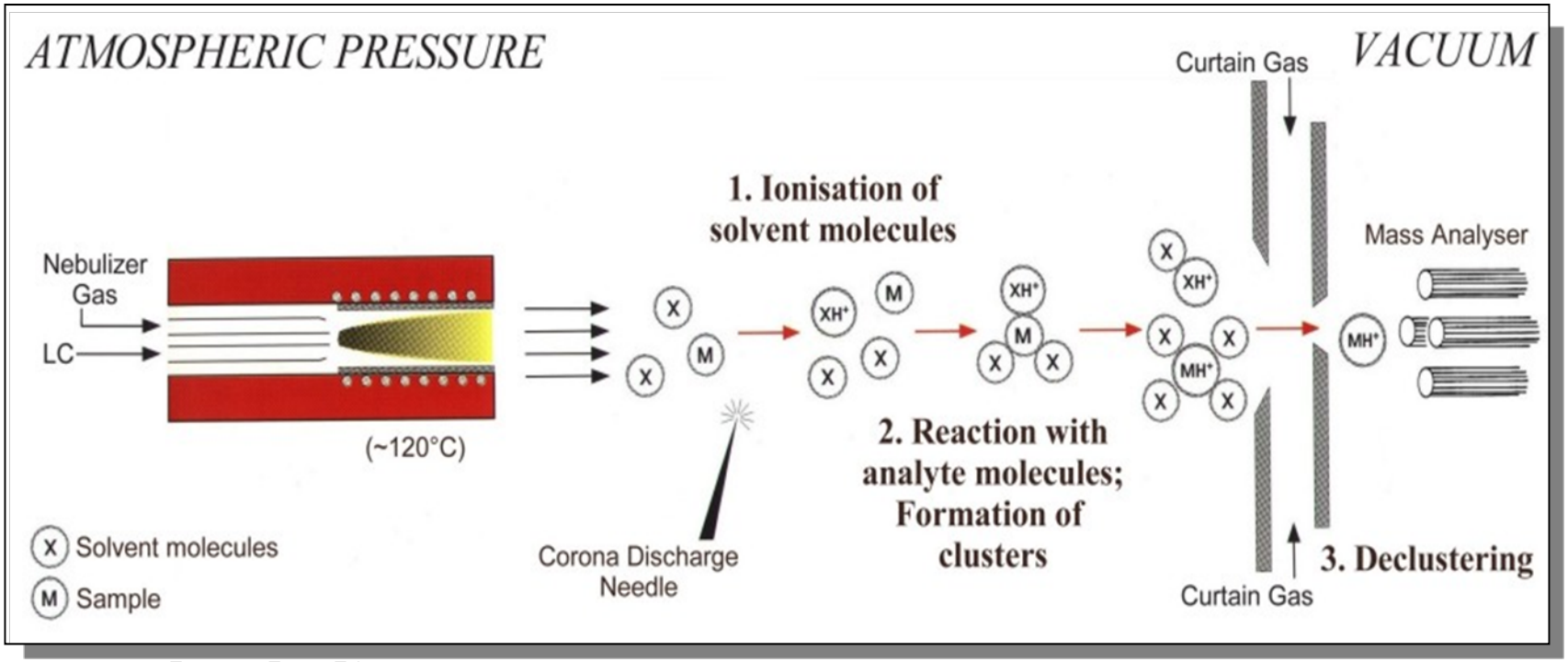
Heated Nebulizer (APCI)



Heated Nebulizer:

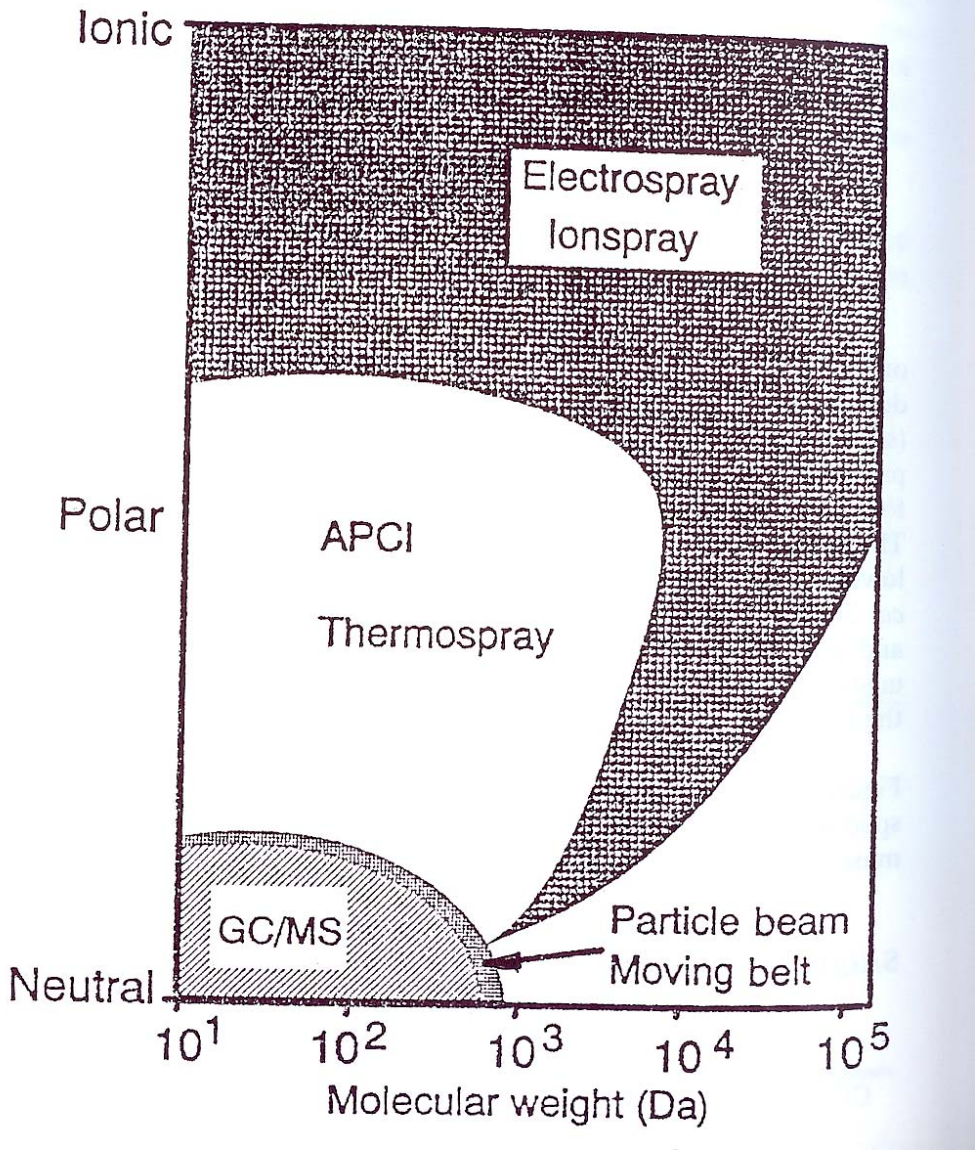
Atmospheric Pressure Chemical Ionisation (APCI)
corona discharge needle
polar to unpolar and thermally stable compounds

Heated Nebulizer (APCI)

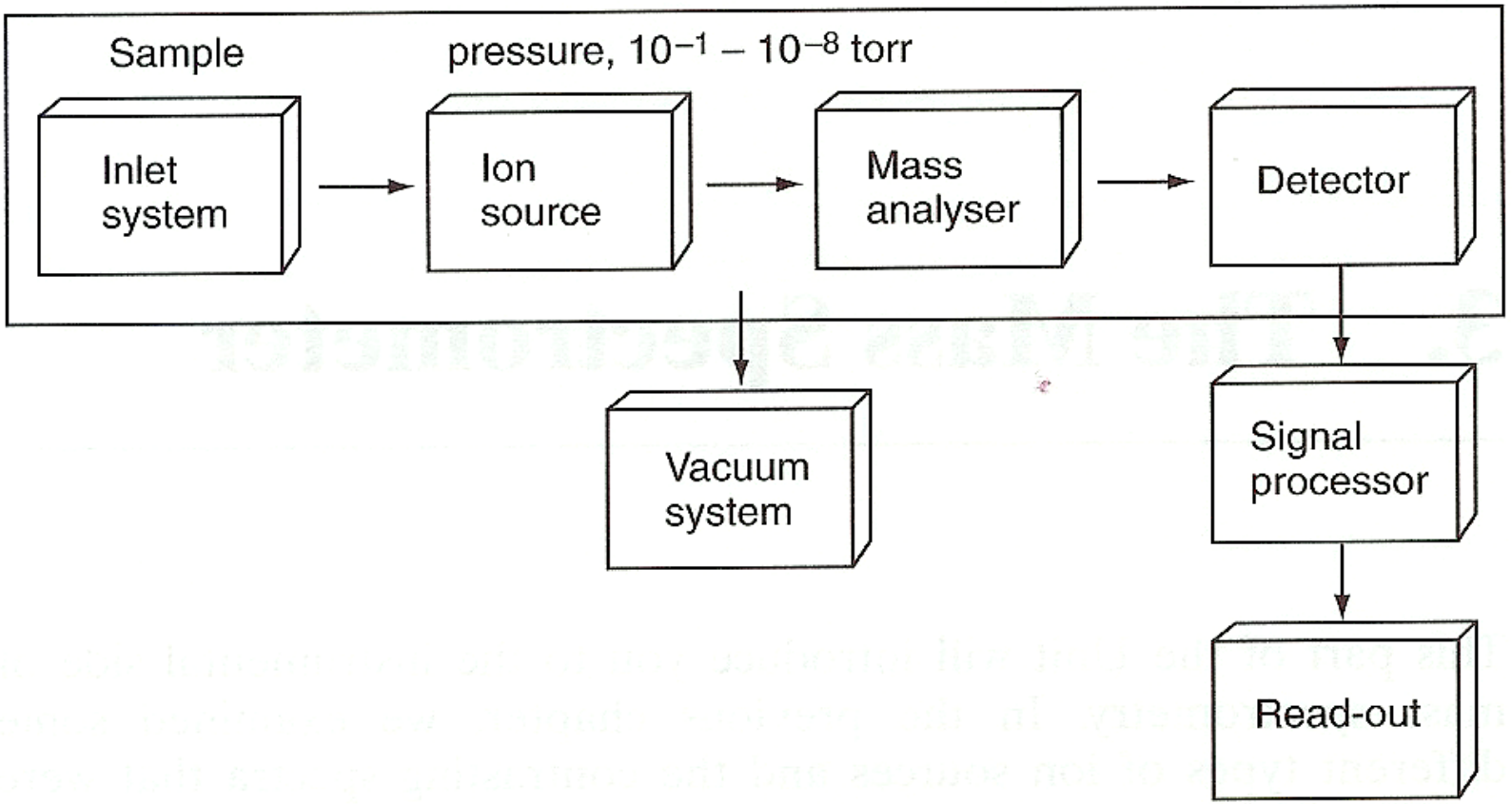


Heated Nebulizer:

Atmospheric Pressure Chemical Ionisation (APCI)
corona discharge needle
polar to unpolar and thermally stable compounds



Application methods of different mass spectrometric coupling methods



The components of a mass spectrometer

Detectors

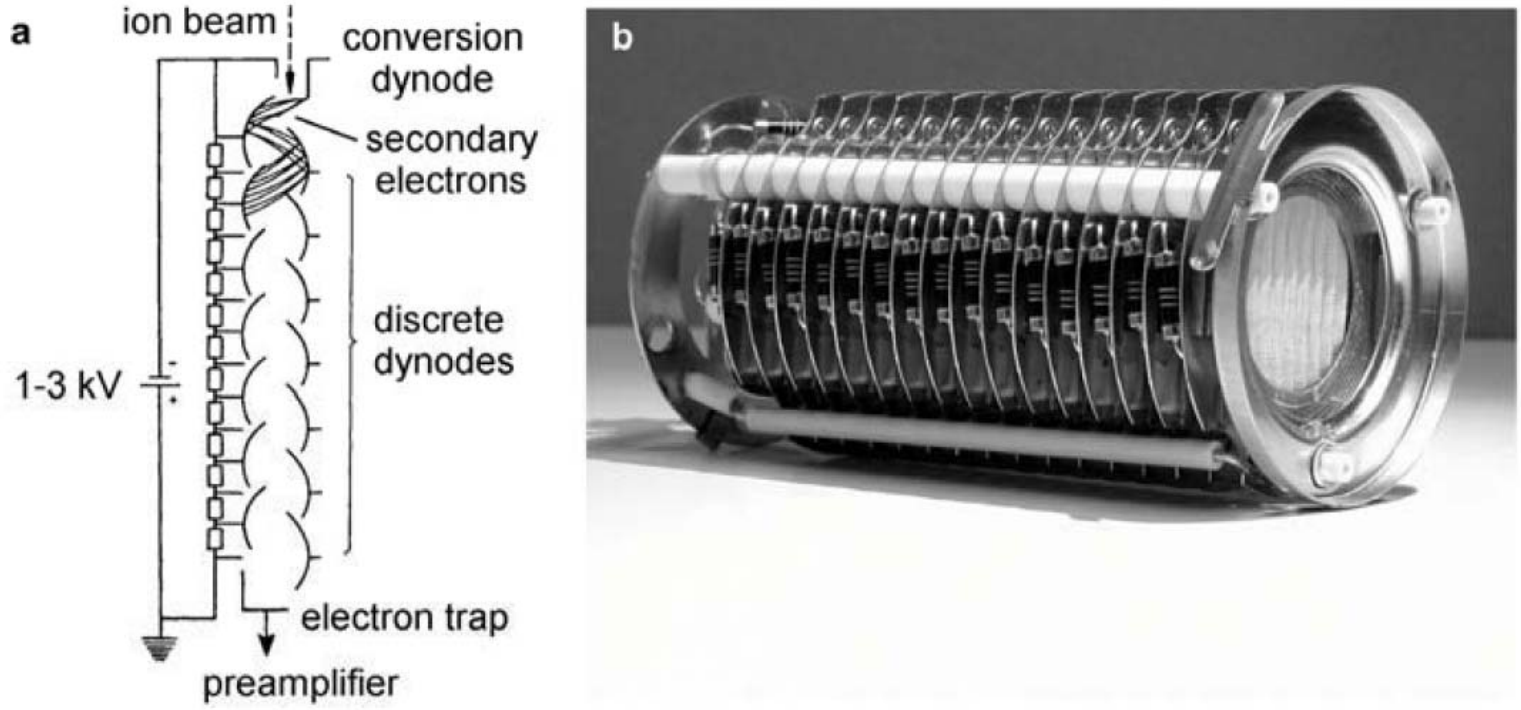


Fig. 4.57. Discrete dynode electron multipliers. (**a**) Schematic of a 14-stage SEM. (**b**) Photograph of an old-fashioned 16-stage Venetian blind-type SEM clearly showing the resistors and ceramics insulators between the stacking dynodes at its side. (**a**) Adapted from Ref. [238] by permission. © Springer-Verlag Heidelberg, 1991.

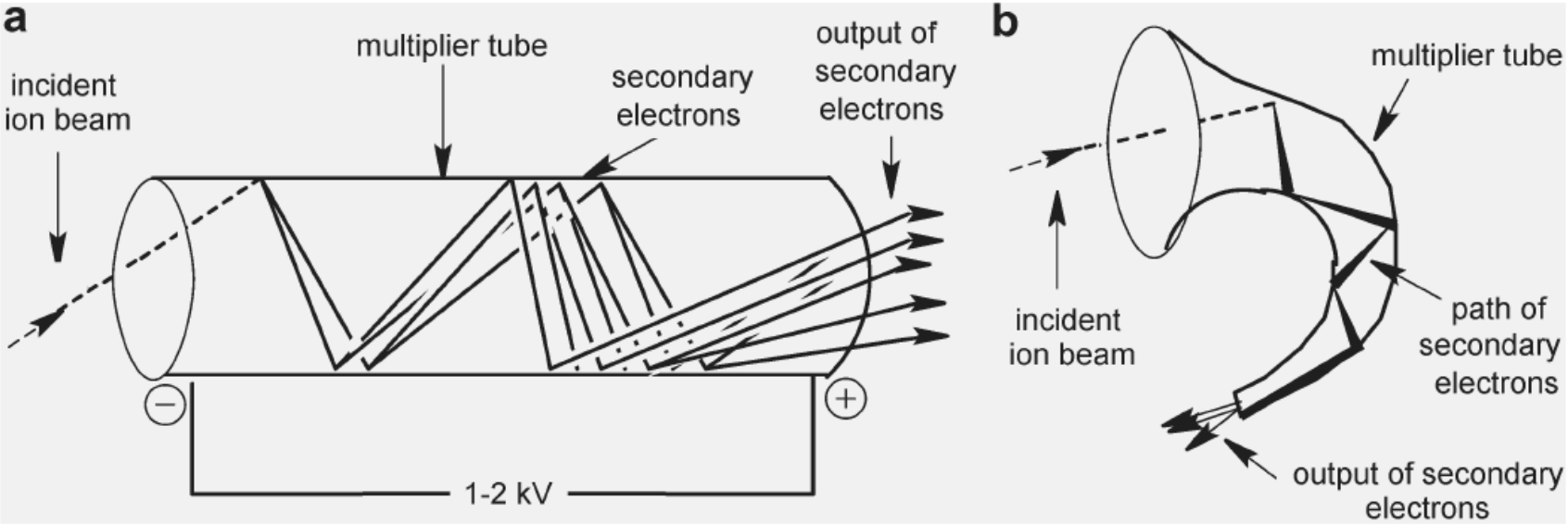


Fig. 4.58. Schematic of linear channel electron multiplier (**a**) and curved channel electron multiplier (**b**). By courtesy of Waters Corporation, MS Technologies, Manchester, UK..

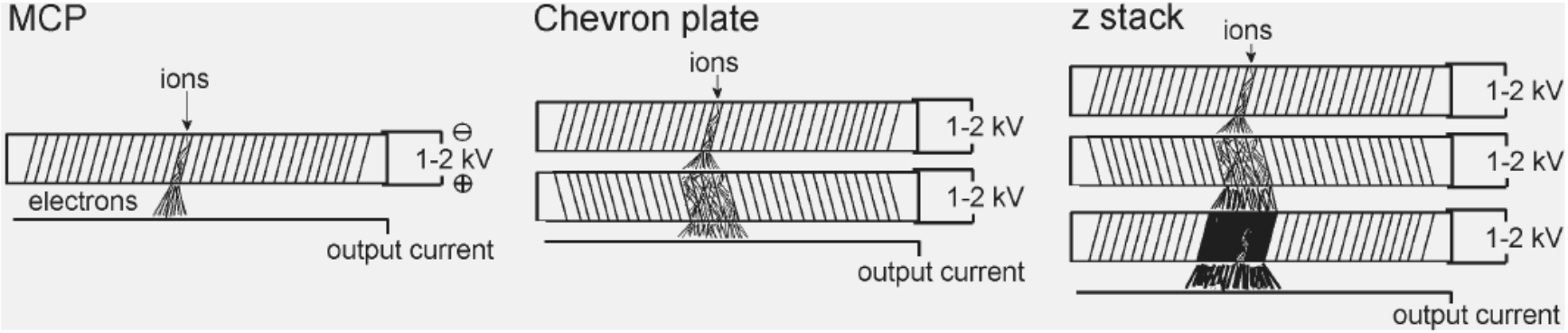


Fig. 4.61. Stacking of MCPs to increase gain. From left: single MCP, Chevron plate, and z-stack configuration. Note the loss of spacial resolution upon stacking.

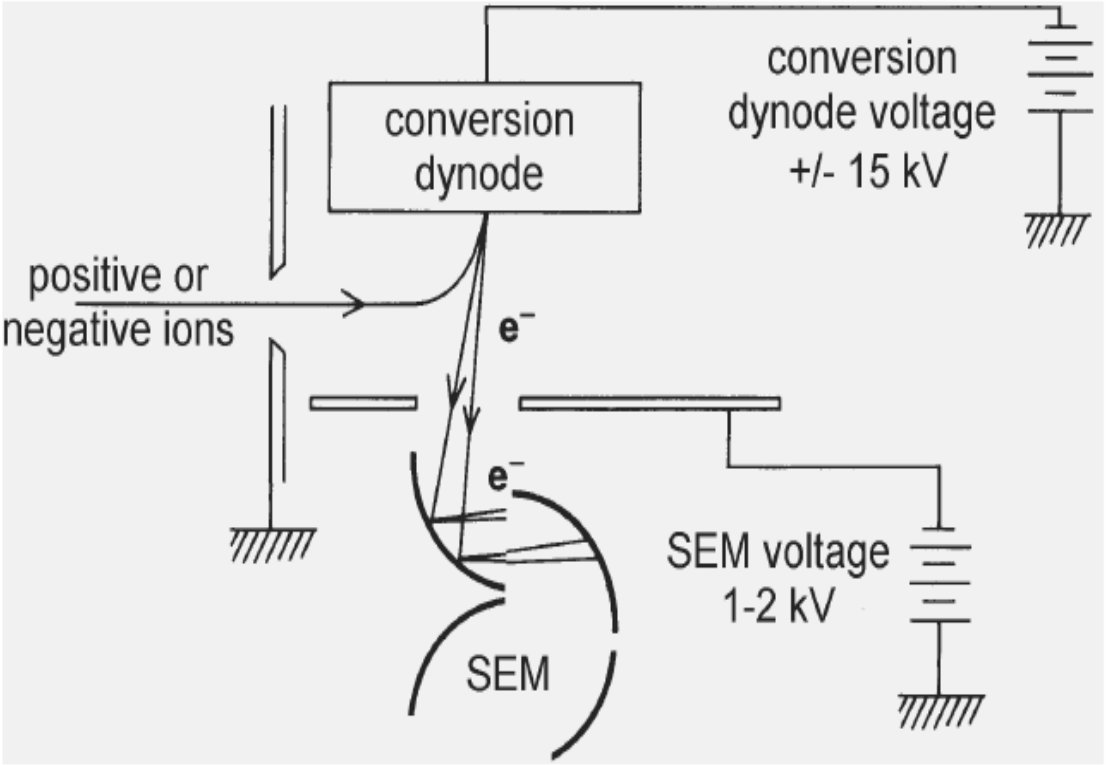


Fig. 4.62. Detector configuration with conversion dynode. By courtesy of JEOL, Tokyo.