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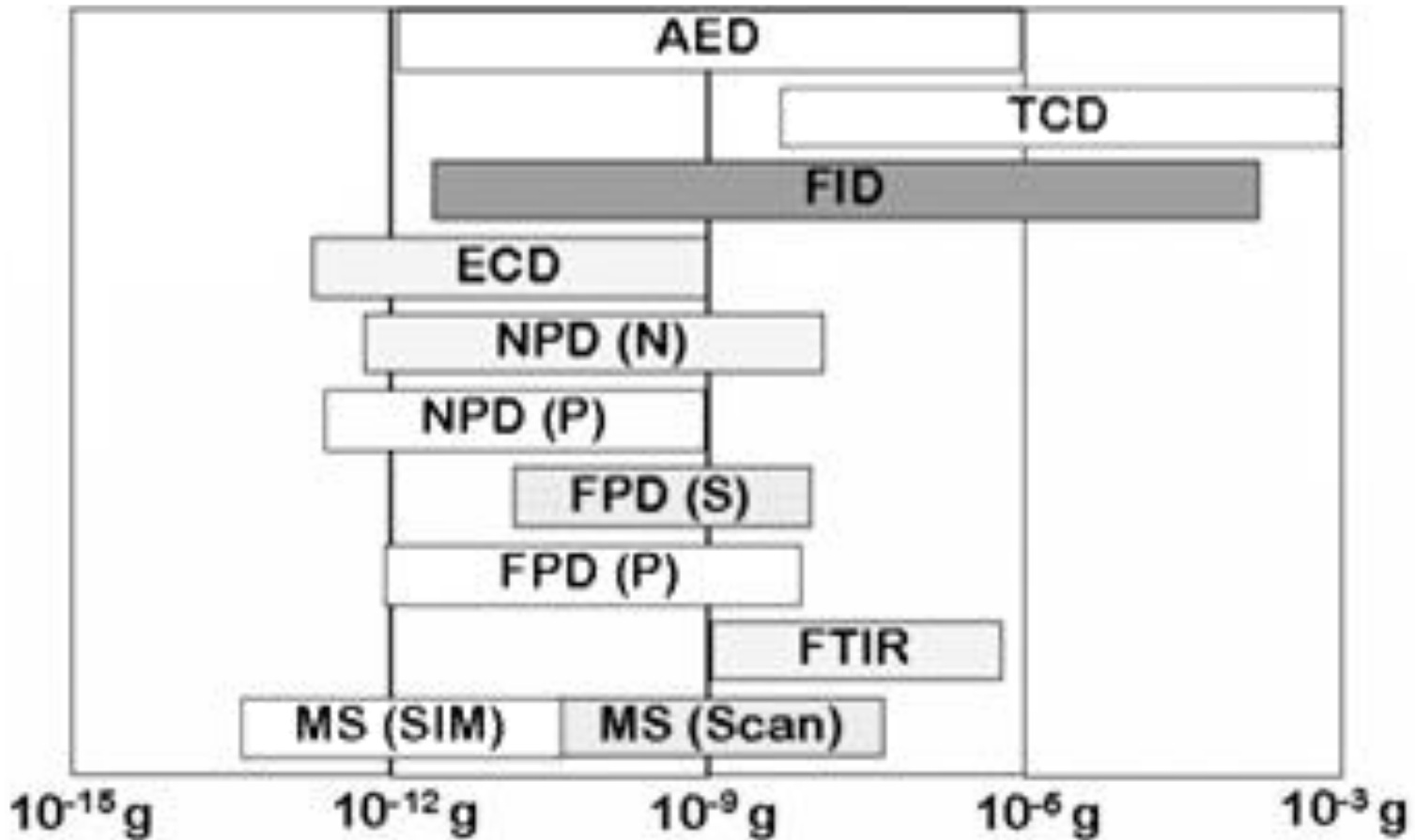
DETECTORS IN GAS CHROMATOGRAPHY

Thermo-conductivity	Thermal conductivity
Flame-ionization	Ionization (hydrocarbons)
Nitrogen-phosphorus	N,P – specific forms
Electron capture	Electronegative structures
Atomic-emission	Emission light
Flame-photometric	P, S - specific forms
Photoionization	UV absorption
Chemiluminescence	Excitation (O_3; F_2)
FTIR	IR + Fourier transformation
Mass spectrometric	Ionization



DETECTORS IN GAS CHROMATOGRAPHY

LOD and working range of GC detectors

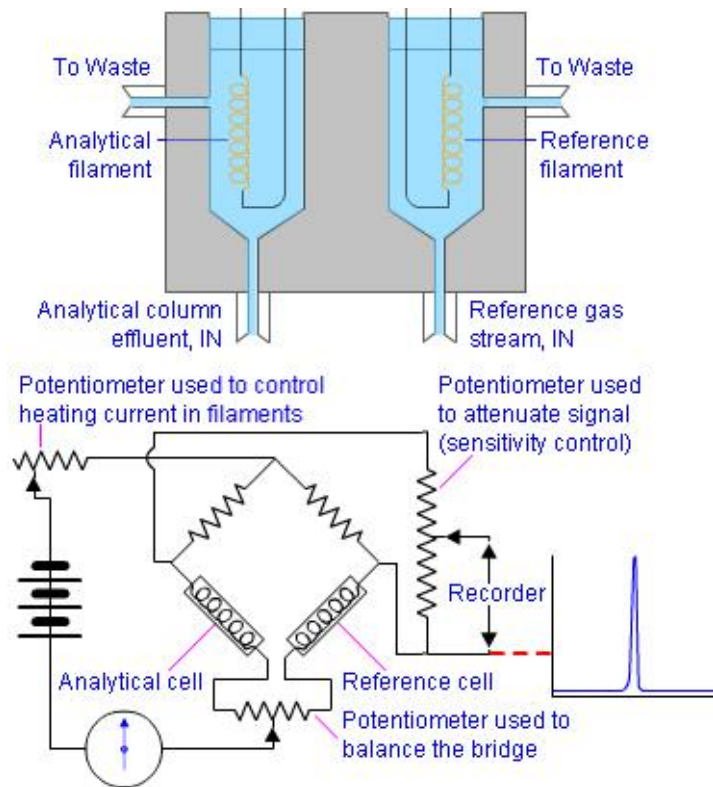


(FIGURE:Hewlett-Packard (Agilent Technologies))

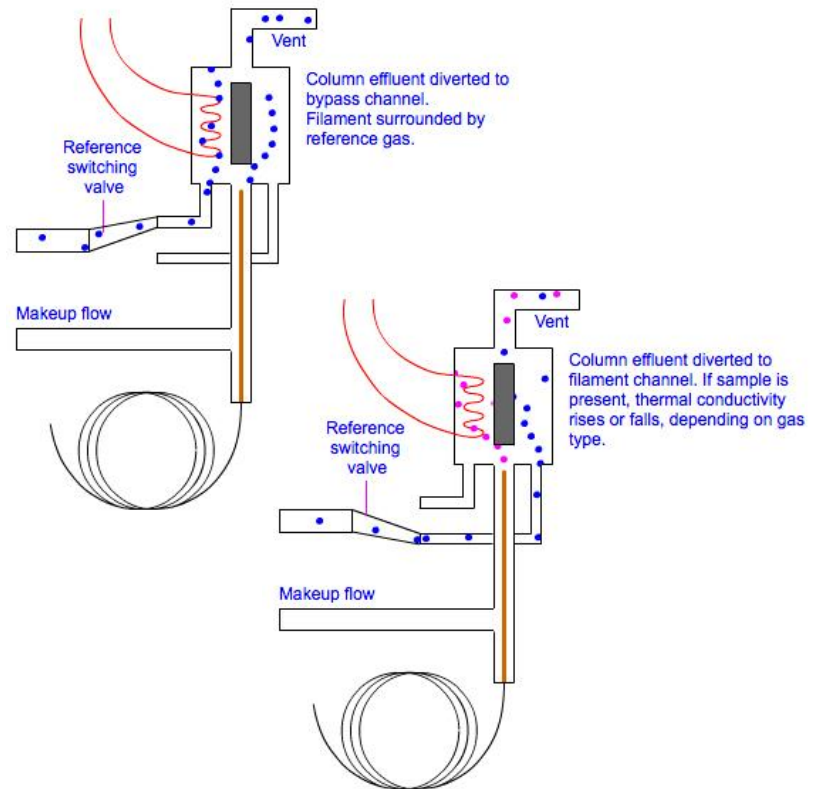
DETECTORS IN GAS CHROMATOGRAPHY

Thermal conductivity detector (TCD) - *katharometer*

Traditionally a two-fiber system
(Wheatstone Bridge)



Single-fiber switching system
frequency ~ 100 ms

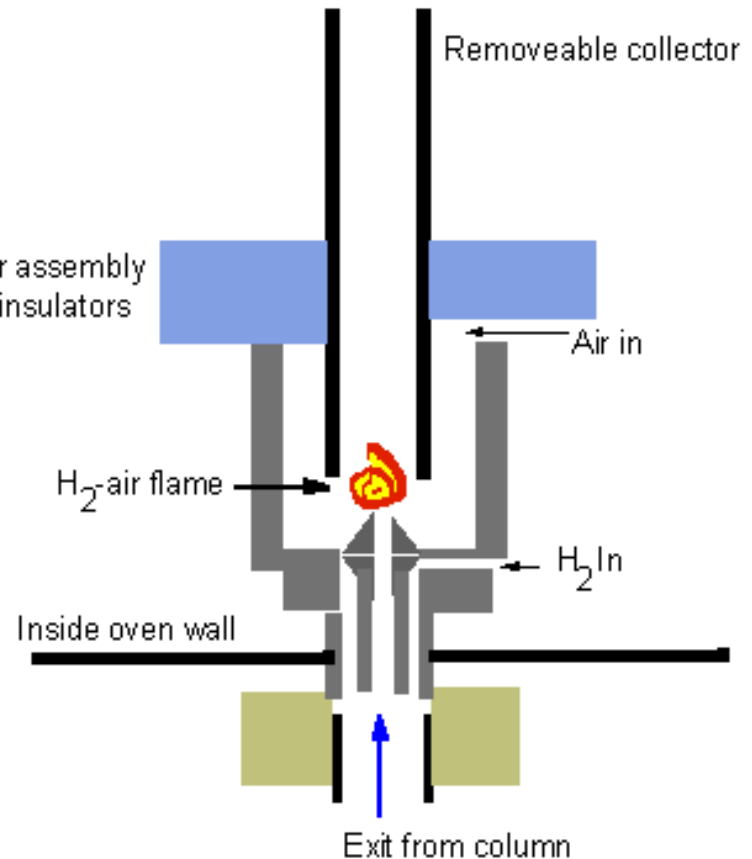


DETECTORS IN GAS CHROMATOGRAPHY

Flame-ionisation detector (FID)

$\text{CH}\bullet + \text{O} \rightarrow \text{CHO}^+ + \text{e}^-$
- various hydrocarbons

Non-detected: H_2O , N_2 ,
 CO_2 , CO , CS_2 , O_2 , NH_3



(FIGURE:Hewlett-Packard (Agilent Technologies))

DETECTORS IN GAS CHROMATOGRAPHY

Nitrogen-phosphorus detector (NPD)

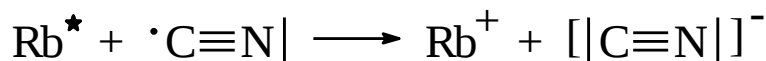
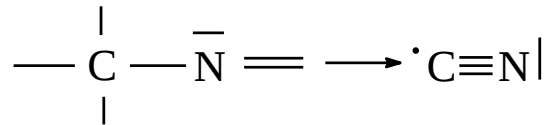
N or P presence



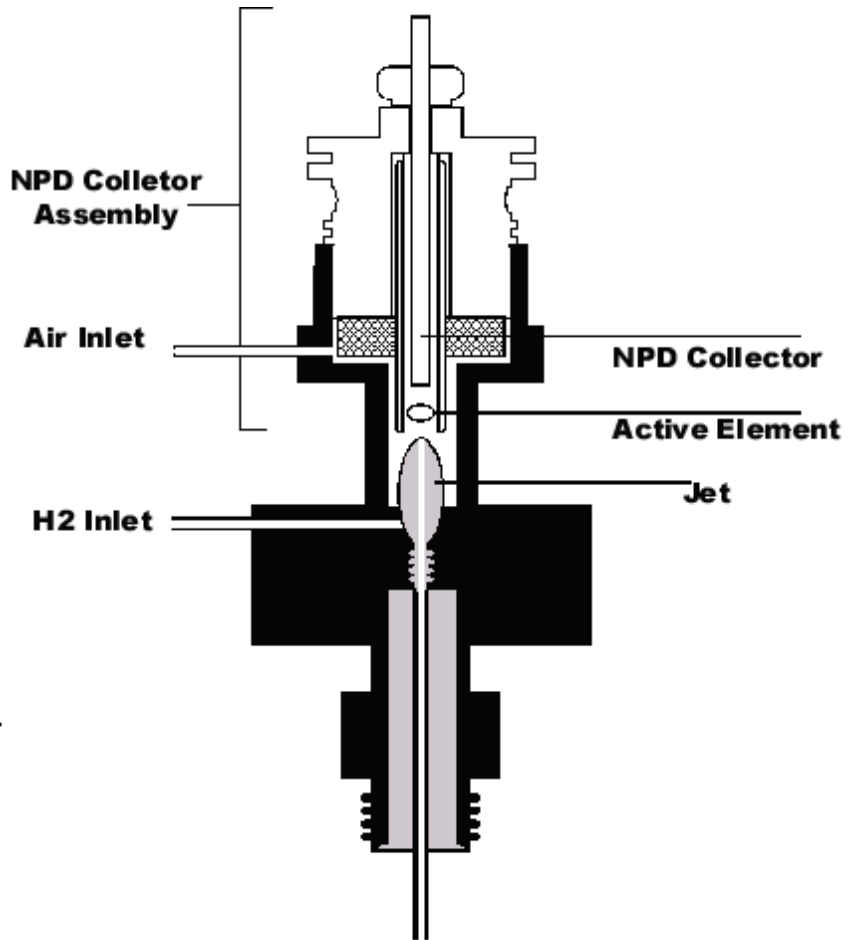
$$\text{N/C} = 10^4$$

$$\text{P/C} = 10^5$$

N: CN



P: PO, PO₂

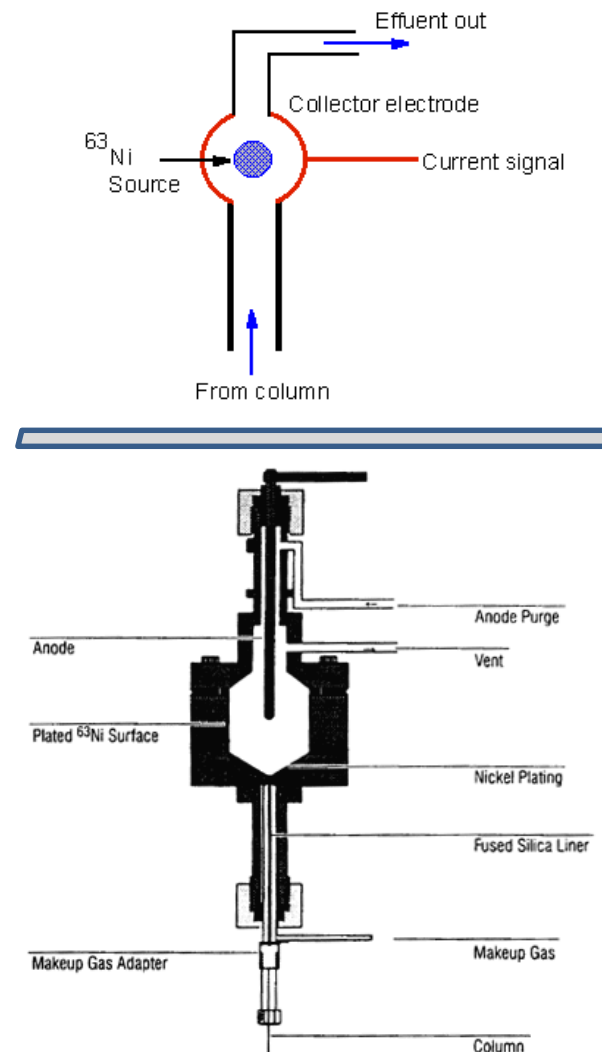


(FIGURE:Hewlett-Packard (Agilent Technologies))

DETECTORS IN GAS CHROMATOGRAPHY

Electron capture detector (ECD)

<i>Compounds</i>	<i>Relative Response</i>
Hydrocarbons	1
Ethers; esters	10
Aliphatic alcohols; ketones; amines; mono - Cl, F	100
mono - Br; di - Cl, F	1000
anhydrides; tri - Cl	10 000
mono - I; di - Br; poly - Cl, F	100 000
di - I; tri - Br; poly - Cl, F	1 000 000



(FIGURE:Hewlett-Packard (Agilent Technologies))

DETECTORS IN GAS CHROMATOGRAPHY

Atomic emission detector (AED)

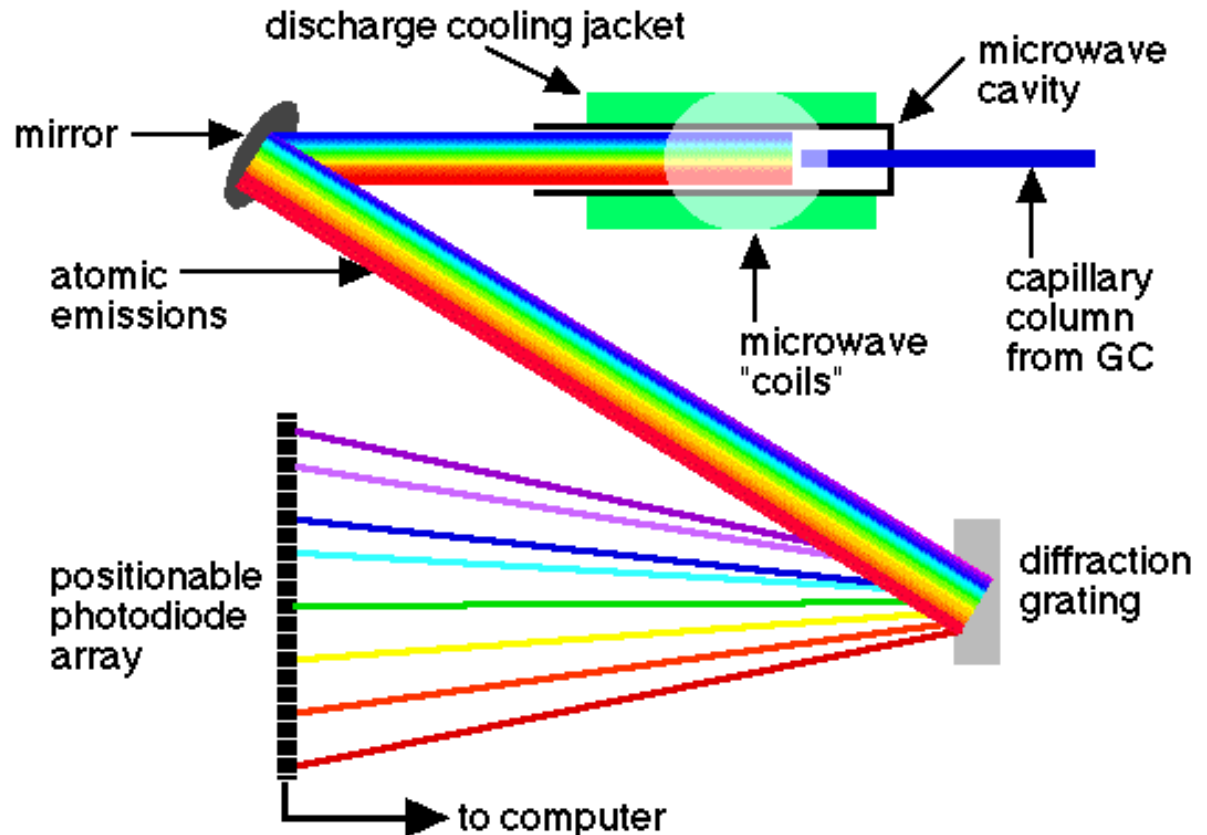
Measuring of
atomic emission
of various
elements at
selective λ

Parallel records
possibility

E.g. compounds
containing

C, Cl, S, P

Universal use –
various LODs



(FIGURE:Hewlett-Packard (Agilent Technologies))

DETECTORS IN GAS CHROMATOGRAPHY

Flame-photometric detector (FPD)

Specific for
P and S

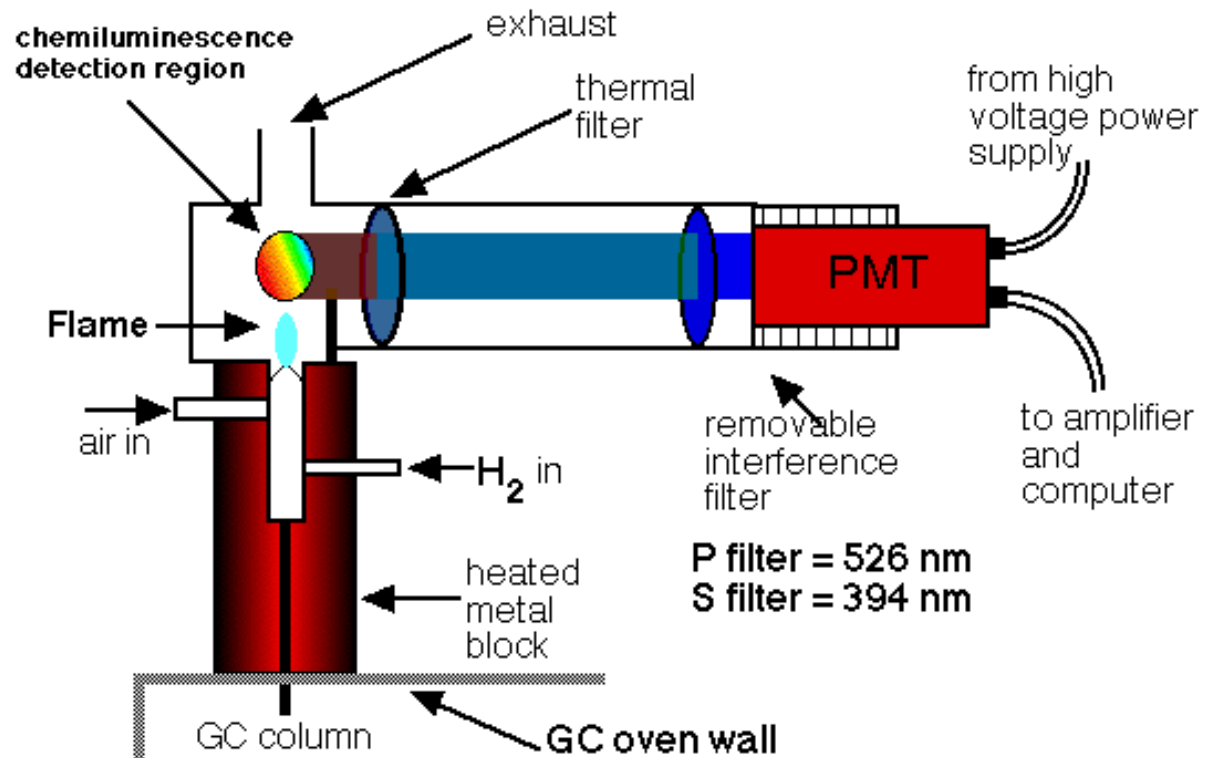
Formation:

HPO^*

$S=S^*$

$P/C = 10^5$

$S/C = 10^5$



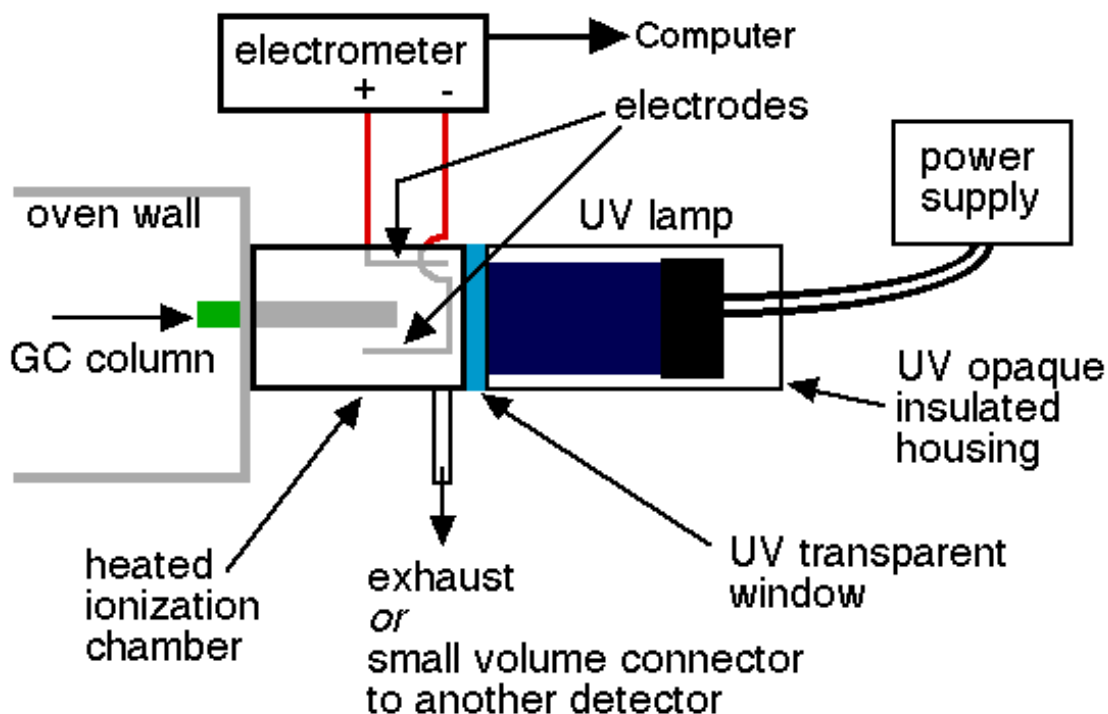
(FIGURE:Hewlett-Packard (Agilent Technologies))

DETECTORS IN GAS CHROMATOGRAPHY

Photoionization detector (PID)



Ionization by UV light - PAHs (10.2 eV)

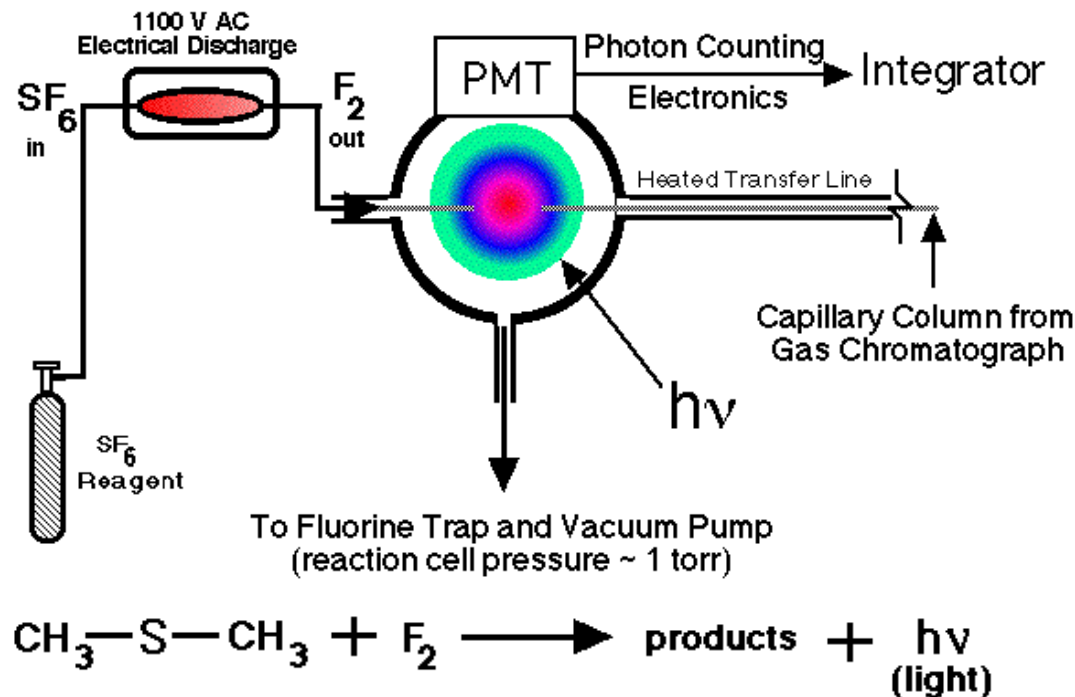
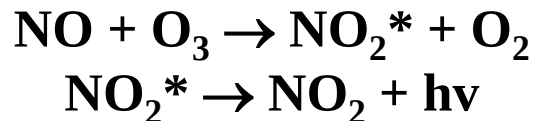


(FIGURE: Hewlett-Packard (Agilent Technologies))

DETECTORS IN GAS CHROMATOGRAPHY

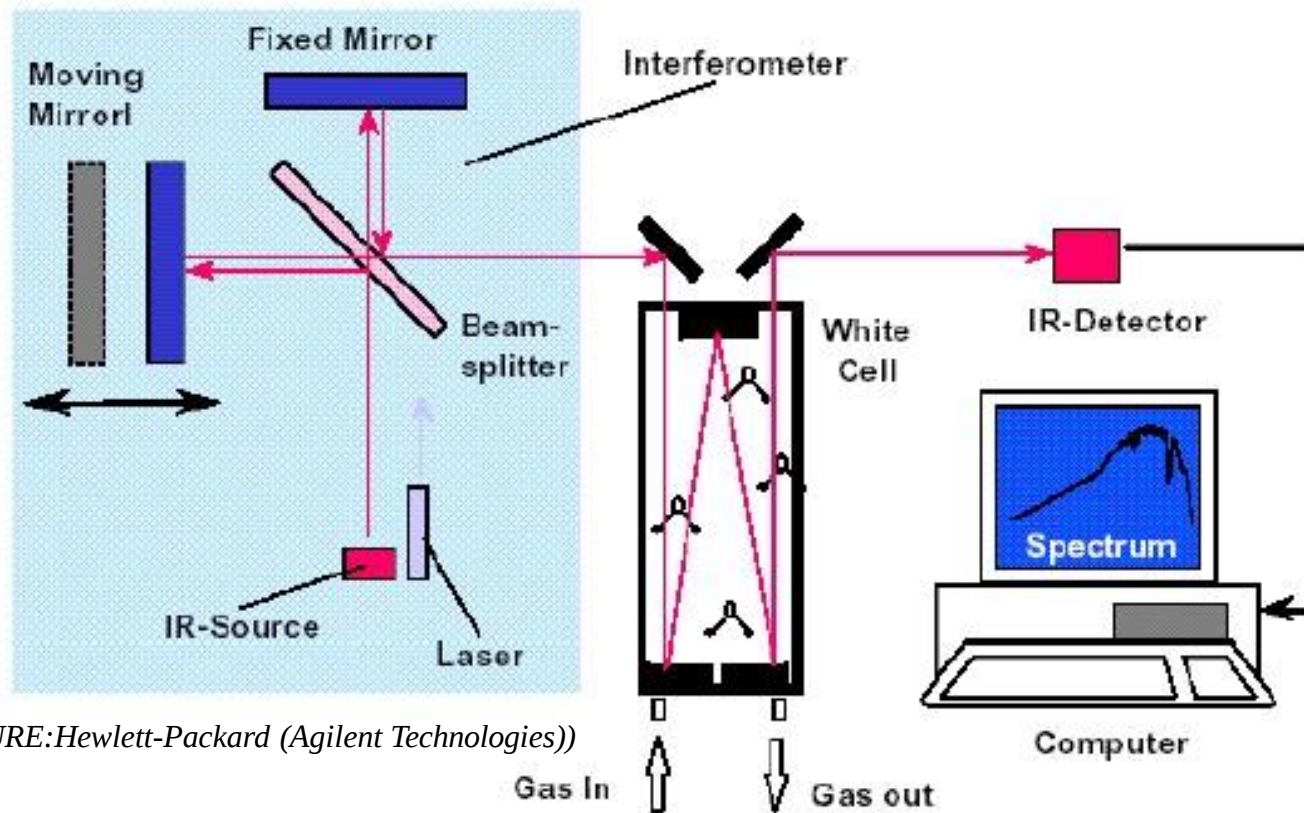
Chemiluminescence detector (RCD, TEA)

Specific – according to specific reaction



DETECTORS IN GAS CHROMATOGRAPHY

Fourier transform infrared detector (FTIR)



(FIGURE:Hewlett-Packard (Agilent Technologies))

Spectral information; higher LODs

DETECTORS IN GAS CHROMATOGRAPHY

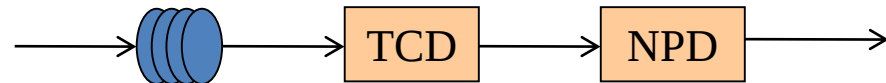
Characteristics of detectors and multiple detection

DestructiveX..... Nondestructive

MassX..... Concentration

FID, NPD, FPDX..... TCD, PID, FTIR

A. Serial configuration



B. Parallel configurations

