# March 16, 2005

- **Exam #2**
  - **TONIGHT!**
  - **B104 Angell**
  - **7 pm**
- **Physics SEMINAR:**

**"Photoelectron Resonance Capture Ionization Mass Spectrometry: *Analysis of Atmospheric Organic Particles"* - Professor Petrucci**

**Today, 4 pm, A442 Cook**



# Flame-AAS versus GFAAS

| **Flame-AAS** | **GFAAS** |
|---|---|
| - Continuous | -Pulsed/Transient |
| - 1-5% sample consumption | -100% sample consumption |
| - mL samples | -μL samples |
| - short residence time (ms) | -long residence time (sec) |
| - high sample throughput | -low sample throughput |
| - ppm - ppb det. limits | - picogram det. limits |

# Sources

- Need a *narrow line source . . . .* ***Why?***

  -Atomic spectral features are very narrow (linewidths typically $< 10^{-2}$ Å)

  -Continuum source neccesitates monochromator with $\Delta\lambda_{eff} < 10^{-3}$ Å . . . not easily done!

  -So, need a *source* which can provide emission at discrete wavelengths with linewidths less than those found in flame or graphite furnace atom cells



# Hollow Cathode Lamps

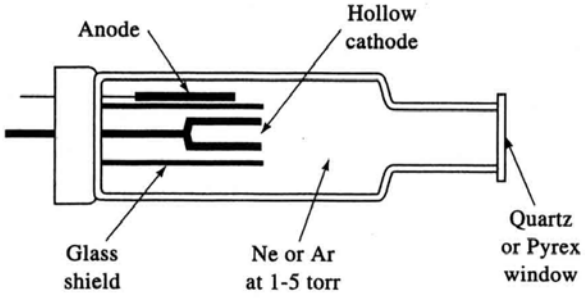
- The ideal source for AAS!

•**Electric discharge** (200-400 volts, 5-15 mA)

•Negatively charged **cathode** made out of element of interest

•Fill gas ions *sputter* atoms from cathode

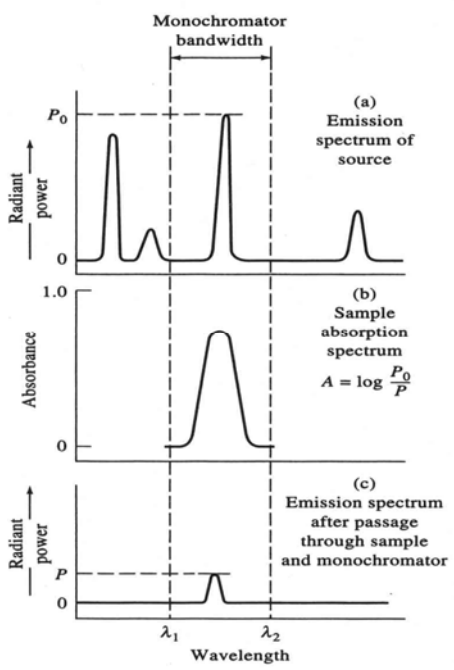
•**Collisions** with $e^-$ excite atoms




*Gives intense narrow line spectrum of cathode material*

# Absorbance Measurement

- Hollow cathode lamp (HCL) source linewidth is much less than absorption linewidth in flame or graphite furnace
- Gives best sensitivity
- Follows Beer's Law




# Spectrometers for AAS

- **Low-to-moderate resolution with PMT detector**
  - Selectivity accomplished with HCL
  - Want maximum light throughput
  - No scanning (cannot obtain an absorbance spectrum)
- **Background Correction?**
  - use a *continuum source* ($D_2$ lamp) to obtain absorbance due to non-atomic species within $\Delta\lambda_{eff}$
  - subtract to obtain net atomic absorption