

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

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Flame-AAS versus GFAAS

Flame-AAS

- Continuous
- 1-5% sample consumption
- mL samples
- short residence time (ms)
- high sample throughput
- ppm - ppb det. limits

GFAAS

- Pulsed/Transient
- 100% sample consumption
- μ L samples
- long residence time (sec)
- low sample throughput
- picogram det. limits

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Sources

■ **Need a narrow line source Why?**

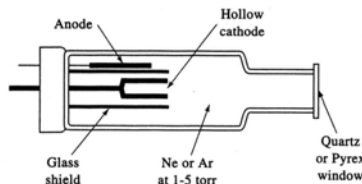
- Atomic spectral features are very narrow (linewidths typically $< 10^{-2} \text{ \AA}$)
- Continuum source necessitates monochromator with $\Delta\lambda_{\text{eff}} < 10^{-3} \text{ \AA}$. . . not easily done!
- So, need a source which can provide emission at discrete wavelengths with linewidths less than those found in flame or graphite furnace atom cells

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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

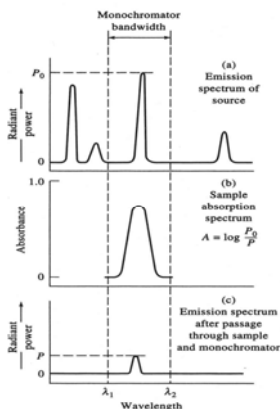


Gives intense narrow line spectrum of cathode material

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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 $\Delta\lambda_{\text{eff}}$
 - subtract to obtain net atomic absorption

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