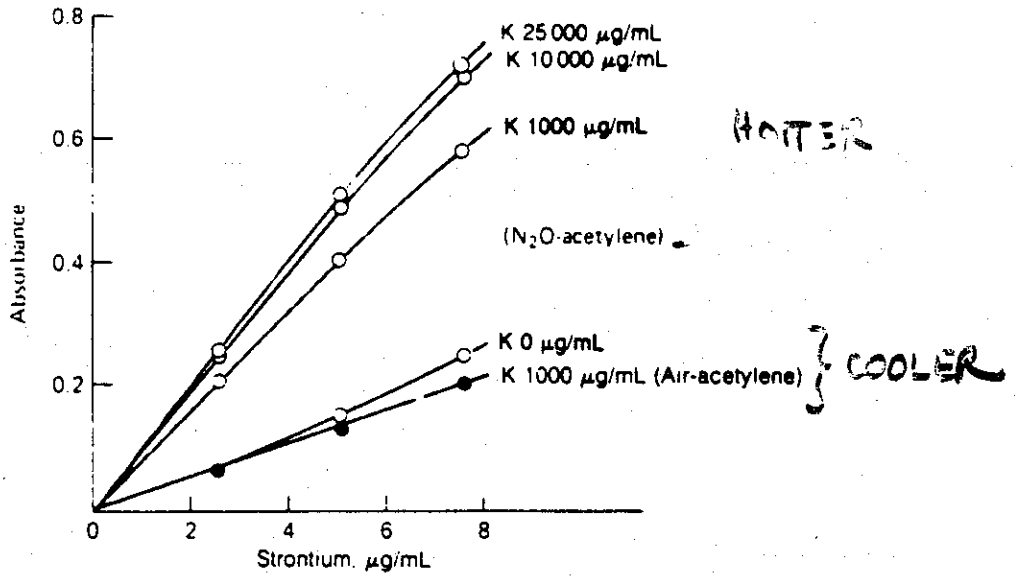


FIGURE 9-17 Effect of potassium concentration on the calibration curve for strontium. (Reprinted with permission from J. A. Bowman and J. B. Willis, *Anal. Chem.*, **1967,** *39*, 1220. Copyright 1967 American Chemical Society.)

What amount of Cs should be added to a flame at 2500 K in order to suppress the ionization of a solution containing 0.23 µg/mL of Na?

$$Na \rightleftharpoons Na^+ + e^- \quad K_{Na} = \frac{(Na^+)(e^-)}{(Na)} = 4.8\times10^{-9} \text{ at } 2500\ K$$

$$Cs \rightleftharpoons Cs^+ + e^- \quad K_{Cs} = \frac{(Cs^+)(e^-)}{(Cs)} = 1.45\times10^{-6} \text{ at } 2500\ K$$

Charge balance: $(e^-) = (Na^+) + (Cs^+)$

$$(e^-) = \frac{K_{Na}(Na)}{(e^-)} + \frac{K_{Cs}(Cs)}{(e^-)}$$

$$(e^-)^2 = K_{Na}(Na) + K_{Cs}(Cs)$$

Want $K_{Na}(Na) \approx 1/100\ K_{Cs}(Cs)$ in order to suppress Na^+ so:

$$0.23\ \mu g/mL \times 1/23\ g/mol = 1/100 \cdot 1.45\times10^{-6}\ (Cs)$$

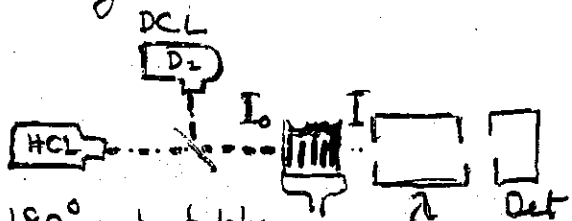
$$(Cs) = 3.31\times10^{-3}\ \mu mol\ mL^{-1}$$

$$(Cs) = 3.31\times10^{-3}\ \mu mol\ mL^{-1} \times 137\ \mu g/\mu mol = 0.45\ \mu g\ mL^{-1}$$

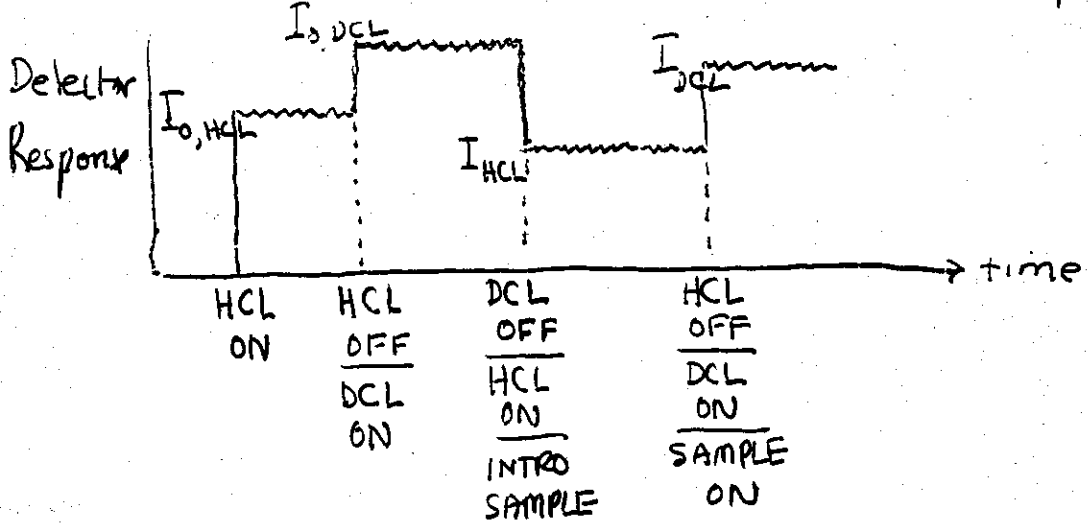
Deuterium Background Correction System:

HCL = Hollow Cathode Lamp

D_2 = Deuterium Continuum Lamp



Each lamp is modulated (on/off) 180° out of phase.



$$I = I_o e^{-\epsilon bc} + I_{au} + I_e - I_{ba} - I_s$$

I_{au} = unabsorbed source radiation (reduce by using HCL)

I_e = flame emission - this is a "DC" source. modulate HCL

I_{ba} = background absorption (soot, molecular absorption) other than analyte

I_s = scattering loss

Now we can write two eqns:

1. $$\frac{I_{o,HCL} - I_{HCL}}{I_{o,HCL}} = f_x \cdot f_s \cdot f_{ba}$$

2. $$\frac{I_{o,DCL} - I_{DCL}}{I_{o,DCL}} = f_s \cdot f_{ba}$$

where:

f_x = fraction absorbed by analyte

f_s = fraction scattered

f_{ba} = fraction lost to background absorption