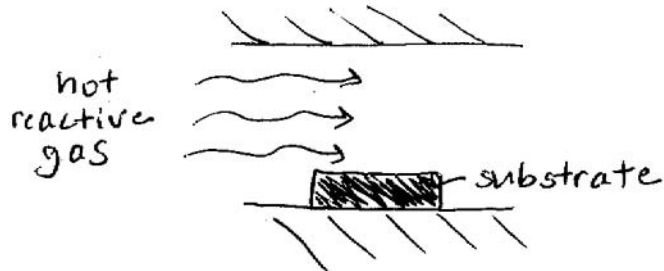


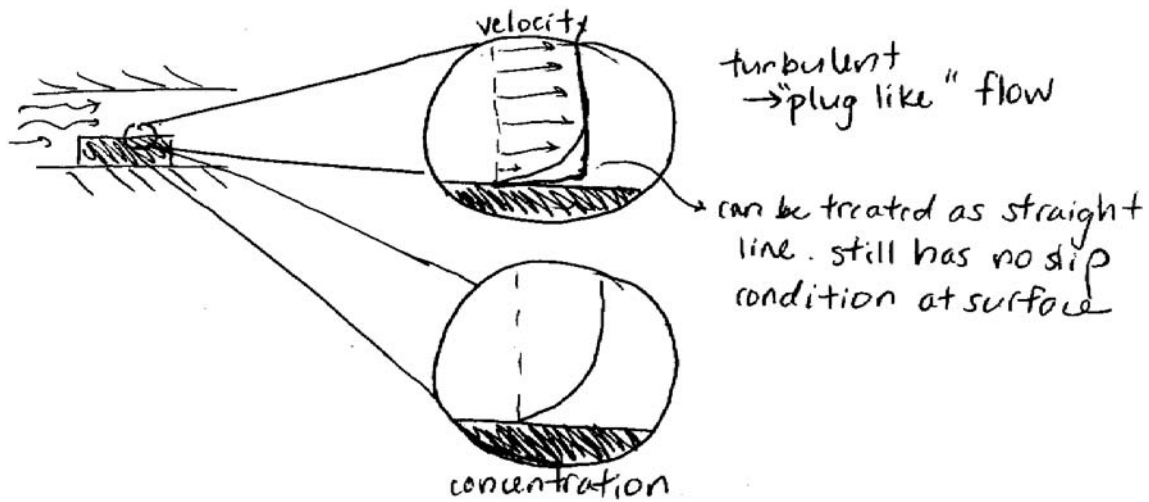
### 3.044 MATERIALS PROCESSING

#### LECTURE 23

#### CVD:



hot reactive gas reacts with surface of substrate and creates a thin layer of reaction product  $\Rightarrow$  used in electronics

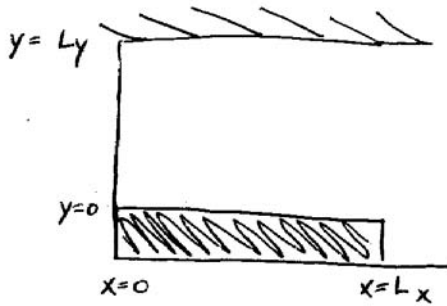


Fick's First Law: 
$$\vec{J} = \underbrace{-D\nabla c}_{\text{Fickian}} + \underbrace{c\vec{V}}_{\text{Drift}}$$

Date: May 16th, 2012.

Mass Conservation/Balance:

Fick's Second Law:  $\frac{\partial c}{\partial t} = D \left( \frac{\partial^2 c}{\partial x^2} + \frac{\partial^2 c}{\partial y^2} \right) + V \frac{\partial c}{\partial x}$

Boundary Conditions:

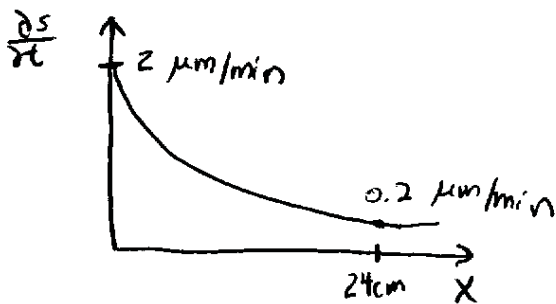
1. at  $x = 0, c = c_i$ ; 2. at  $y = 0, c = 0$ ; 3. at  $y = L_y, \frac{dc}{dy} = 0$

Assume Steady-State:

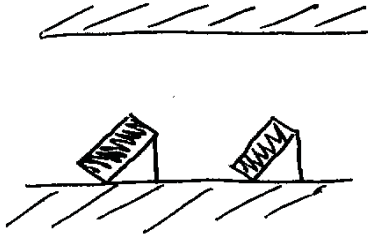
$$c = \frac{4c_i}{\pi} \sin\left(\frac{\pi y}{2L_y}\right) \exp\left(\frac{-\pi D x}{4VL_x^2}\right)$$

$$\frac{\partial s}{\partial t} \propto J|_{y=0} \frac{Mw}{\rho} = \frac{Mw}{rho} D \left. \frac{\partial c}{\partial y} \right|_{y=0}$$

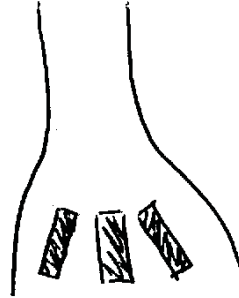
$$\frac{\partial s}{\partial t} = \frac{2c_i D Mw}{L_y \rho} \exp\left(\frac{-\pi^2 D x}{4VL_x^2}\right)$$



**Solution:** solve with geometry



or



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3.044 Materials Processing  
Spring 2013

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