

$$R = \frac{u_0}{v} d \quad (\text{Eq. 1})$$

$$u = -\frac{1}{4\mu} \frac{dp}{dx} (r^2 - y^2) \quad (\text{Eq. 2})$$

$$u_0 = \frac{r^2}{8\mu} \left(-\frac{dP}{dx}\right) \quad (\text{Eq. 3})$$

$$\frac{dP}{dx} = \frac{\Delta P}{l} = \frac{1/2 \rho V^2}{l} \quad (\text{Eq. 4})$$

$$Q = \frac{\pi r^4 u_0}{\mu} \left(-\frac{dP}{dx}\right) \quad (\text{Eq. 5})$$

or

$$Q = \frac{\pi}{16} \frac{D^3 V^2}{A \nu} \quad (\text{Eq. 6})$$

$$\dot{w} = GI \quad (\text{Eq. 7})$$

$$I = I_0 \left(1 - \exp\left[-k \frac{c}{c_0}\right]\right) \quad (\text{Eq. 8})$$

$$\dot{c} = \frac{dc}{dx} u = -\frac{GI}{V} \quad (\text{Eq. 9})$$

$$x = -\frac{uV}{(\dot{w})_s} \left\{ (c - c_0) + \frac{c_0}{k} \ln \left(\frac{1 - \exp\left(-\frac{kc}{c_0}\right)}{1 - \exp(-k)} \right) \right\} \quad (\text{Eq. 10})$$

$$\frac{x}{l} = -\frac{\pi}{256} \left(\frac{D}{A}\right)^2 \frac{(V_0)^2}{\nu} \frac{c_0}{(\dot{w})_s} \left[\frac{c}{c_0} - 1 + k \ln \left(\frac{1 - \exp(-kc/c_0)}{1 - \exp(-k)} \right) \right] \quad (\text{Eq. 11})$$

$A = 10$ Hole diameter = 18 mils $c_0 = 140 \text{ g/ft}^3$ $v_0 = 8 \text{ ft/min}$ $\dot{w}_s = 0.0001 \text{ g/sec}$ $\chi = 0.0367 \text{ ft}^3/\text{g}$
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TABLE 1. Based line parameters.

VARIABLE	MAGNITUDE OF INFLUENCE
Aspect Ratio	Square
Hole Diameter	Square
Agitation Speed	Square
Bulk Concentration	Super Linear
Surface Plating Rate (Current Density)	Linear
Plating Bath Index	Linear

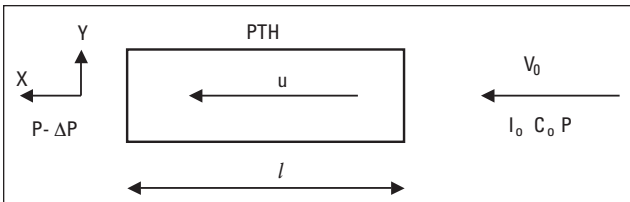


FIGURE 1. When plating fluid passes through a through hole, it is governed by the Navier-Stokes equations.

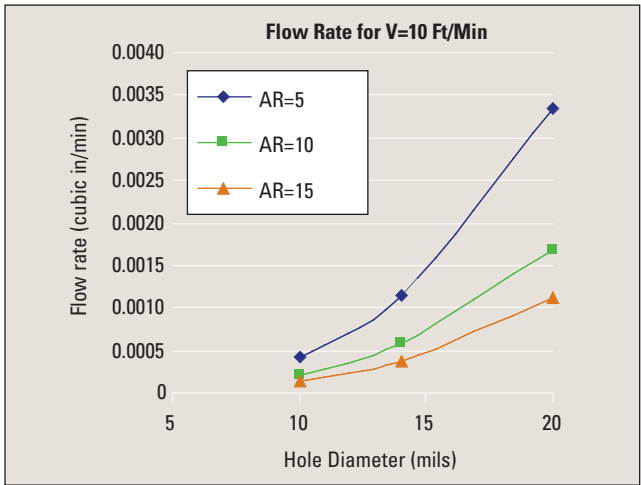


FIGURE 3. Hole diameter impacts flow rate more significantly than aspect ratio.

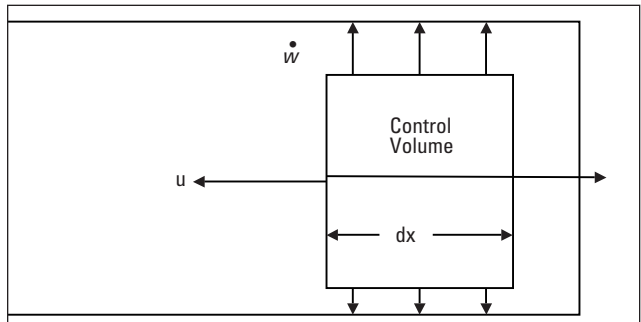


FIGURE 4. Plating fluid is shown moving through the PTH.

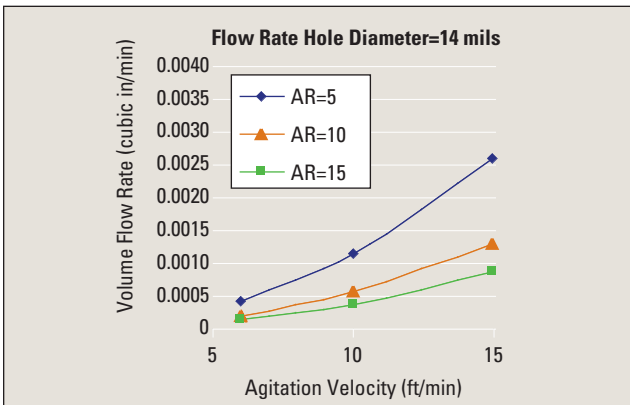


FIGURE 2. Agitation velocity impacts flow rate more significantly than aspect ratio.

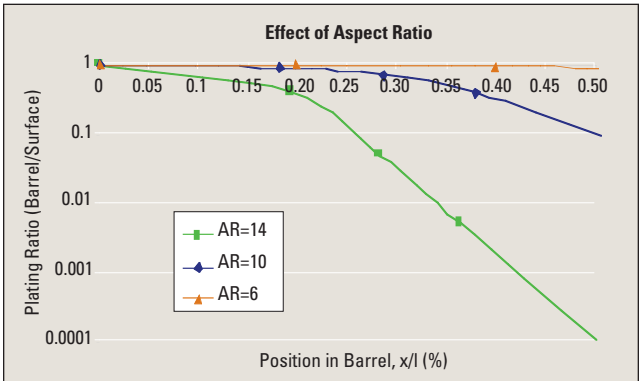


FIGURE 5. Effect of aspect ratio and hole diameter on plating thickness.

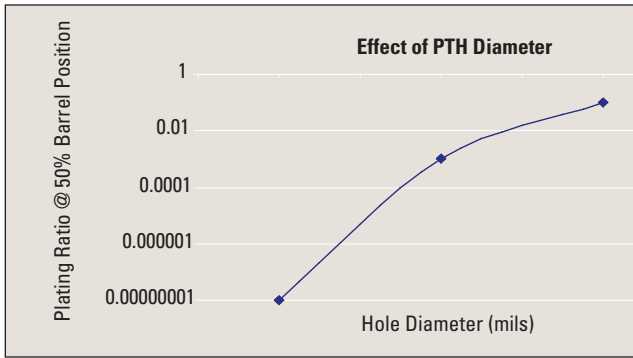


FIGURE 6. Effect of PTH diameter on plating ratio.

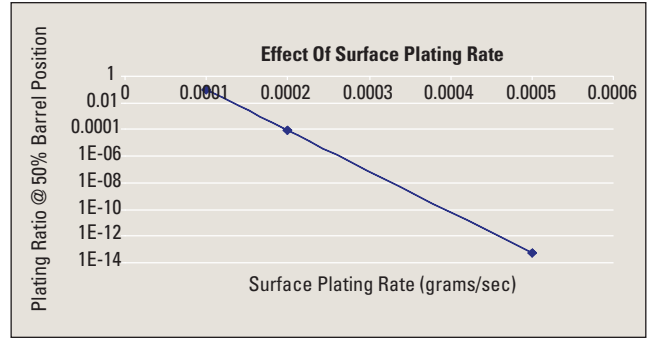


FIGURE 10. Effect of surface-plating rate on plating ratio.

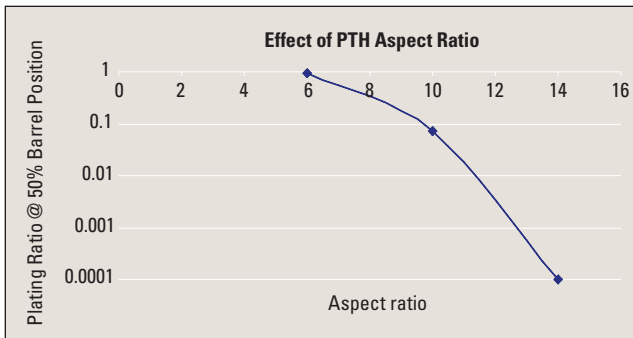


FIGURE 7. Effect of aspect ratio on plating ratio.

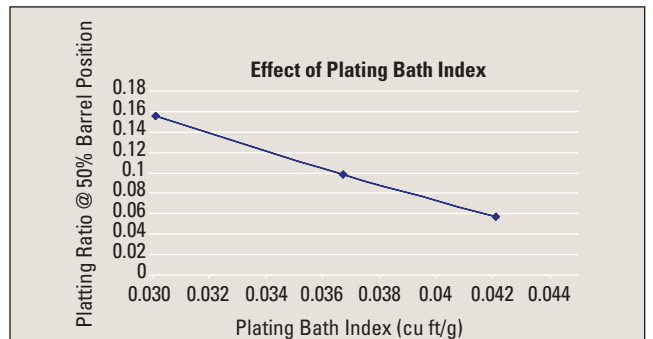


FIGURE 11. Effect of plating bath index on plating ratio.

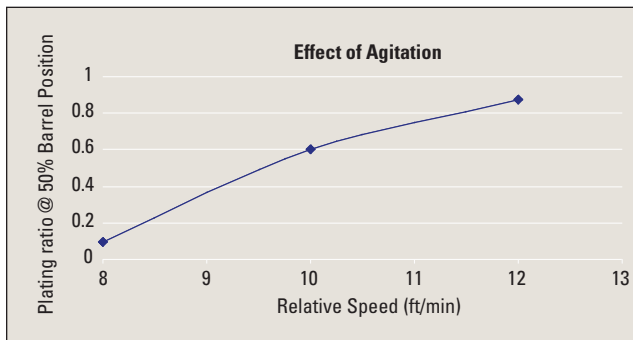


FIGURE 8. Effect of agitation on plating ratio.

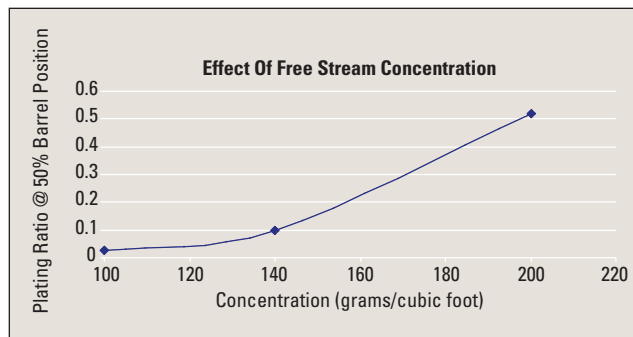


FIGURE 9. Effect of free-stream concentration on plating ratio.