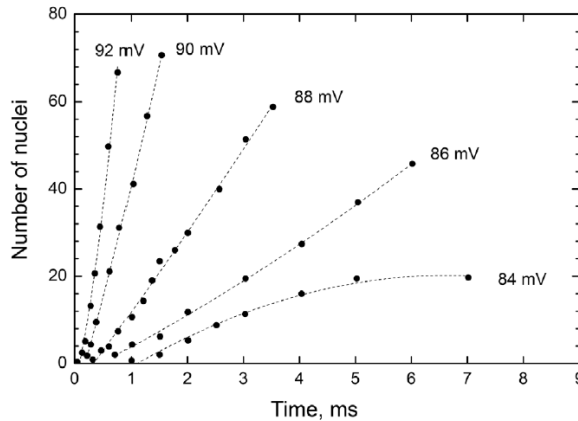


CH692 in class w4d2

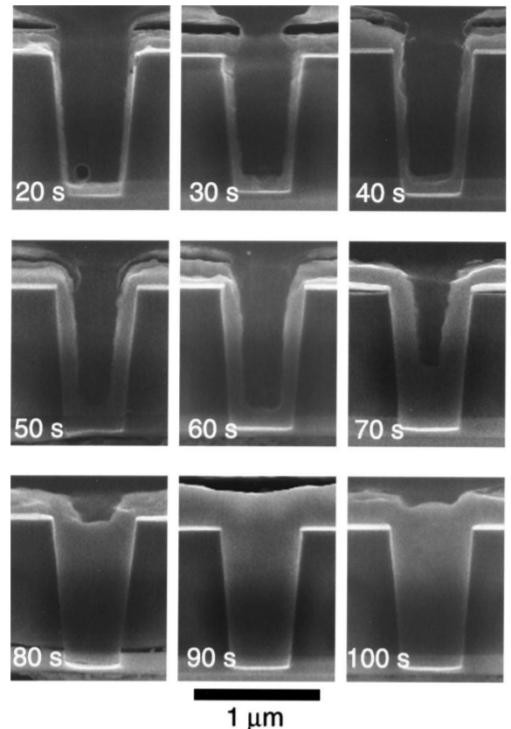
$$A_s^3 = B \nabla^2$$

1. Calculate B for a sphere:
2. Why does applied overpotential change curve below?



**Figure 13.8** The number of nuclei versus time for electrodeposition of mercury on Pt at different overpotentials. *Source:* Adapted from Toshev 1969.

3. How do you expect the rate of nucleation to depend on temperature?
4. Who would you expect temperature to affect the morphology of metal electrodeposit? What factors do you think you would need to consider?
5. What reasons do you think pulsed electrodeposition is used?
6. Electrodeposition is used to fill vias in semiconductor processing, as in shown in the figure below from Moffat. Explain the conditions needed to obtain uniform deposition and via infilling. How might you achieve this via additives? Please include discussion of thermodynamics, kinetics, transport, as well as interactions with additives, in your answer.



*Journal of The Electrochemical Society*, **149** (12) C637-C641 (2002)  
0013-4651/2002/149(12)/C637/5/\$7.00 © The Electrochemical Society, Inc.

**Via Filling by Electrodeposition**

**Superconformal Silver and Copper and Conformal Nickel**

D. Josell,<sup>a,\*</sup> B. Baker,<sup>a,\*</sup> C. Witt,<sup>b</sup> D. Wheeler,<sup>a</sup> and T. P. Moffat<sup>a,\*</sup>

<sup>a</sup>National Institute of Standards and Technology, Metallurgy Division, Gaithersburg, Maryland 20899, USA  
<sup>b</sup>International Sematech, Austin, Texas, USA