**Electrochemical copper deposition in etched ion track membranes**

Schuchert IU, Toimil-Molares ME, Dobrev D, Vetter J, Neumann R, Martin M
*JOURNAL OF THE ELECTROCHEMICAL SOCIETY 150 (2003) C189-C194*

Etched ion track polycarbonate membranes served as templates for the potentiostatic deposition of copper nanowires. For different overvoltages, current vs. time curves were recorded and analyzed. A qualitative model describing the deposition process has been developed. Up to six different time periods can be distinguished in each curve corresponding to different steps that dominate the overall deposition process. For short times, copper deposition is controlled by charge transfer. Then a transition region follows where the charge transfer and the diffusion overvoltage are comparable. The following three regions are assigned to diffusion control. Initially, while the thickness of the diffusion layers is smaller than the remaining empty pore length, the diffusion occurs linearly inside the pores. When the diffusion layers increase in size, the overall process becomes determined by radial diffusion of ions toward the pore openings. After some time the radial diffusion fields start to overlap for neighboring pores, and the deposition is characterized by linear diffusion toward the whole surface. Finally, when the pores are filled up with copper, metal caps start to grow on top of the membrane. For each time regime, existing theories were used to analyze the process quantitatively. Agreement with experimental data was found for two regimes.