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Formation of metal wire arrays via electrodeposition in pores of Si, Ge and III–V semiconductors

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Abstract

Deep straight macropores in n-type Si have been completely filled with copper (Cu). Homogeneous metal deposition inside the deep pores was achieved by means of electroplating using a solution containing only CuSO4 mixed with H2SO4 and an optimized process that begins at the bottom of the pores. Pores as deep as 150 µm could be filled without encountering the so-called "bottleneck" effect. Straight macropores with diameters below 100 nm and extreme aspect ratios in InP could be filled with Cu using a pulsed process. Interconnected pores extending in the available set of 111 directions in 100 GaAs and forming domains could not be filled with Cu; instead the volume occupied by the pore domain was completely filled with Cu; i.e. the porous structure was destroyed. A possible reason for this new effect will be given.