220
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Title:Microfabrication of fine electron beam tunnels using UV-LIGA and embedded polymer monofilaments for vacuum electron devices
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Abstract:Vacuum electron devices require electron beams to be transported through hollow channels that pass through an electromagnetic slow-wave circuit. These electron 'beam tunnels' are shrinking toward sizes smaller than traditional techniques can manage as the operating frequencies push toward the THz. A novel technique is described and experimentally demonstrated that uses polymer monofilaments of arbitrary cross-sectional shape combined with ultraviolet photolithography (UV-LIGA) of SU-8 photoresists. This combination of monofilaments and SU-8 structures comprises a 3D mold around which copper is electroformed to produce high-quality beam tunnels of arbitrary length and size along with the electromagnetic circuits. True round beam tunnels needed for upper-millimeter wave and THz vacuum electron devices can now be fabricated in a single UV-LIGA step. These techniques are also relevant to microfluidic devices and other applications requiring very small, straight channels with aspect ratios of several hundred or more. © 2012 IOP Publishing Ltd.
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