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Nonochannel networks, light emission and waveguiding of micro- and nanotubes, and ultra-compact coils

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Quite generally, thin solid films can be partially released from a substrate surface by selective underetching and form into various 3D micro- and nano-objects [1-3]. Here, we show that such released layers form into complex nanochannel networks, which can be fluid-filled and emptied within fractions of a second. Furthermore, we demonstrate that single material layers roll-up into micro- and nanotubes. In particular, we show that all-Si tubes can be fabricated. Quantum emitters such as InAs/GaAs quantum dot heterostructures are integrated into the wall of rolled-up microtubes, and we study the emission and the waveguiding properties of such “quantum dots in a tube” [4]. Finally, metal/semiconductor bilayers are rolled up into microtubes. This technique opens the way to realize and integrate ultra-compact coils, transformers and capacitors on a single chip [5]. I am grateful to my collaborators Y. Mei, R. Songmuang, C. Mendach, C. Deneke, D. Thurmer, F. Cavallo, and A. Rastelli (all Max-Planck-Institut fuer Festkoerperforschung Stuttgart, Germany)

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