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Abstract:In this paper we review metamaterials fabricated from self-rolling strained metal-semiconductor layer systems. These systems relax their strain upon release from the substrate by rolling up into microtubes with a cross-section similar to a rolled-up carpet. We show that the walls of these microtubes represent three-dimensional optical metamaterials which so far could be used, for example, for the realization of broadband hyperlenses, fishnet metamaterials, or optically active three-dimensional metamaterials utilizing the unique possibility to stack optically active semiconductor heterostructures and metallic nanostructures. Furthermore, we discuss THz metamaterials based on arrays of rolled-up metal semiconductor microtubes and helices. © 2012 Stephan Schwaiger et al.
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