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Photonic Crystal Cavities in Cubic (3C) Silicon Carbide¹

MARINA RADULASKI, THOMAS BABINEC, SONIA BUCKLEY, ARMAND RUNDQUIST, E. L. Ginzton Laboratory, Stanford University, Stanford, CA 94305, U.S.A., J PROVINE, Department of Electrical Engineering, Stanford University, Stanford, CA 94305, U.S.A., KASSEM ALASSAAD, GABRIEL FERRO, Laboratoire des Multimateriaux et Interfaces, Universite de Lyon, 69622 Villeurbanne Cedex, France, JELENA VUCKOVIC, E. L. Ginzton Laboratory, Stanford University, Stanford, CA 94305, U.S.A. — Silicon carbide (SiC) combines many of the outstanding material properties of other well-known optical and quantum optical materials, including strong optical nonlinearity, high Young's modulus, and a host of optically-active crystalline defects, in a single CMOS-compatible platform. For many applications in classical and quantum information processing, the material properties of the cubic silicon carbide polytype (3C-SiC) in particular are advantageous. We therefore present the design, fabrication, and characterization of high quality factor and small mode volume planar photonic crystal cavities in cubic 3C-SiC thin films (200 nm). We demonstrate cavity resonances across the infrared telecommunications band, with wavelengths from 1.25 - 1.6 μm . Finally, we highlight our progress developing higher Q/V nanobeam cavities, as well as extending this optical cavity platform towards integration with SiC color centers.

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