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Production of silicon modified to have enhanced infrared absorption E. WELD, R. AYACHITULA, K. DE LA HARPE, L. BRANDT, M. CHILTON, R.J. KNIZE, B.M. PATTERSON, US Air Force Academy — We demonstrate the enhanced optical properties of silicon microstructures formed by irradiation of a silicon wafer by a modulated continuous wave (CW) laser beam in the presence of SF_6. The microstructures are doped with about 0.6% sulfur, which extends the absorption well below the 1.1um bandgap of crystalline silicon and results in a 60% increase in the absorption of infrared radiation. The microstructured silicon produced using microsecond pulses of CW light demonstrates comparable infrared absorption enhancement to black silicon made using more expensive and complicated laser systems. This enhanced absorption as a result of these microstructures has been studied over the past decade in an effort to create high responsivity detectors and night vision goggles and improve the efficiency of solar cells. We will also discuss additional methods that allow tunability and scalability in the production of silicon modified to demonstrate increased infrared absorption.

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