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Optoelectronic metamaterials for sub-wavelength imaging in the mid infra red regime MAHESH KRISHNAMURTHI, JUSTIN SPARKS, NEIL BARIL, RONGRUI HE, PIER SAZIO, JOHN BADDING, VENKATRAMAN GOPALAN — The mid infrared (MIR) wavelength range of 4-10μm is critically important to various technologies such as sensing, night vision, nondestructive testing, human health, and scientific research. We have developed a sub-wavelength imaging system in the MIR. The fabrication is based on the high-pressure chemical fluid deposition platform developed in our laboratories to create periodic arrays of waveguides inside the holes of a silica based microstructured optical fiber. Waveguides fabricated within each of these holes, acts as a pixel in the infra red camera. The waveguides in each of the holes of the microstructured optical fiber are tapered down to sub-wavelength dimensions at the input plane. Tapering the microstructured optical fiber down to sub-wavelength dimensions will enable sub-wavelength resolution and, also magnify the image at the output plane. The magnification at the output plane also helps in using the commercially available imaging systems to record the information. The details of numerical modeling, fabrication scheme and characterization of the infrared camera will be discussed. Basic essential features such as optical isolation, magnification and elementary imaging concepts will be presented. In addition, design variations that can be adopted to improve the resolution of the camera will be discussed.

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