Circularly-Polarized Terahertz Radiation from a High-Tc Bi-2212 Mesa

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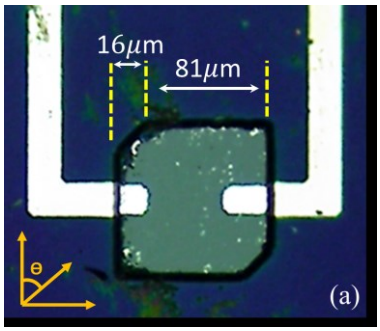
Since the demonstration of high-intensity terahertz (THz) radiation from a Bi-2212 mesa [1], there have been a large number of studies discussing this type of THz sources [2]. This is due to the compact size, broad frequency tunability range and extremely monochromic radiation that it possesses. THz radiation generated from rectangular Bi-2212 mesas is linearly polarized [3]. However, a circularly-polarized (CP) radiation is required for many applications such as wireless communications and spectroscopy [2]. Conventionally, CP radiation can be generated by manipulating the linearly-polarized waves using an external optical device such as quarter wave plates. However, these optical devices are bulky and expensive, and not suitable for the portability needed in the THz applications in which a monolithic source is more useful.

In this work, we experimentally introduce a method to generate CP radiation from a monolithic source by using a square shaped Bi-2212 mesa with truncated edges. The device shown in Fig. 1(a) has a square side length of a 97 μm, and isosceles right triangle-shaped truncated edges with a leg length of 16 μm. A Si-bolometer and a lock-in amplifier were used to detect the THz radiation. Polarization characteristics shown in Fig. 1(b) were measured by using a wire grid polarizer placed in-between the cooled device at 20 K and the bolometer. The radiation polarization was found to be tunable from an elliptical to a circular polarization depending on the applied voltage. The minimum axial ratio was found to be around 1 in a bias voltage of 2.11 volts. These results pave the way for designing new mesa geometries to control the polarization of THz radiation generated from Bi-2212 based sources [4].



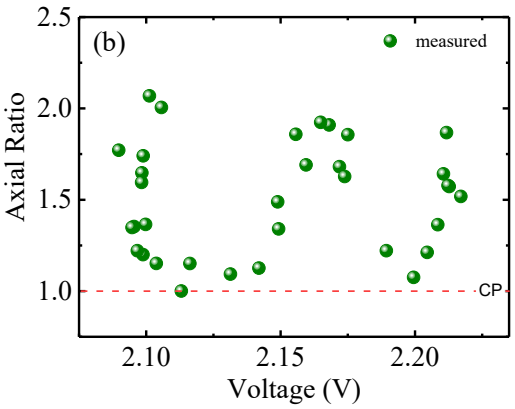


Fig. 1 (a) Microscopic Photograph of Sample , (b) Measured Axial Ratio.

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