Monolithic generation of polarized THz radiation from superconducting Bi-2212 mesas.

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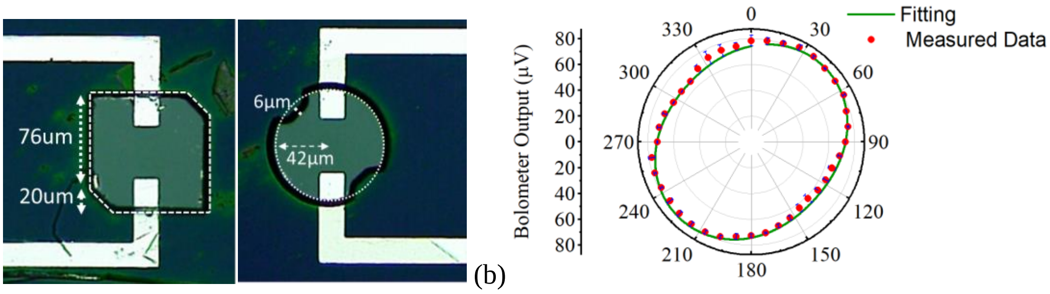
Continuous-wave terahertz sources made of high-T_c superconducting $Bi_2Sr_2CaCu_2O_{8+\delta}$ (Bi-2212) have been extensively studied since it was developed ten years ago [1]. This type of THz sources is compact in size, with large tunable frequency ranges, and highly monochromic radiations. Circularly polarized (CP) THz radiation is commonly achieved in labs by introducing optical devices (e.g., quarter wave plate) into the beam path. Nevertheless, monolithic generation of CP is highly in demand for compact and portable devices. The polarization of THz radiation generated from Bi-2212 has been numerically studied in multiple publications [2–4]. In this study, we experimentally demonstrate the manipulation of the polarization state in Bi-2212 based devices monolithically using methods similar to that applied by Microstrip patch antennas [5]. The achieved circular polarization state is determined by using the truncated edge square mesa shape [2,6] and cylindrical mesa shape with notched sides as shown in Fig. 1(a) and Fig. 1(b) respectively. In cylindrical notched mesas the polarization state, as represented by the axial ratio (AR), was found to be as low as 0.8 dB, at a temperature of 30 K with an AR tunability between circular to elliptical polarization (AR > 3dB). Fig. 1(c) shows the radiation intensity as detected by Si-Bolometer at a bias voltage of V_{bias}= 1.314 V for cylindrical notched mesa.



(a) (b) (c)

Fig. 1 (a) Truncated edge square mesa. (b) Cylindrical mesa with notched sides. (c) Bolometer output vs. polarizer's angle for cylindrical type mesa at V_{bias} = 1.314 V.

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