EDP1-7

Improvement of spatial resolution using Substrate Absorption type STJ

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An electromagnetic wave having a frequency range from 0.1 to 10 THz is called a THz (terahertz) wave. It is expected to find applications in various fields since it has both radio wave and light wave. We have proposed a substrate absorption type superconducting tunnel junction (STJ) for the THz detector that absorbs the THz waves by the substrate and detects phonons generated in the substrate [1].

The phonon isotropically diffuses in the substrate when the THz waves are illuminated from the opposite side of the STJ across the substrate. It causes the degradation of the spatial resolution. To solve this problem, we have proposed a new THz detector which restricts the phonon diffusion by trenches on the back side of the substrate as shown in Fig 1. The trenches have Al layer which prevents the absorption of the THz wave at the trenches. The formation of the trenches and the deposition of the Al layer do not affect the quality of the STJ [2]. In this research, we demonstrate the phonon restriction using the trenches. The fabrication method and the measured results will be presented.

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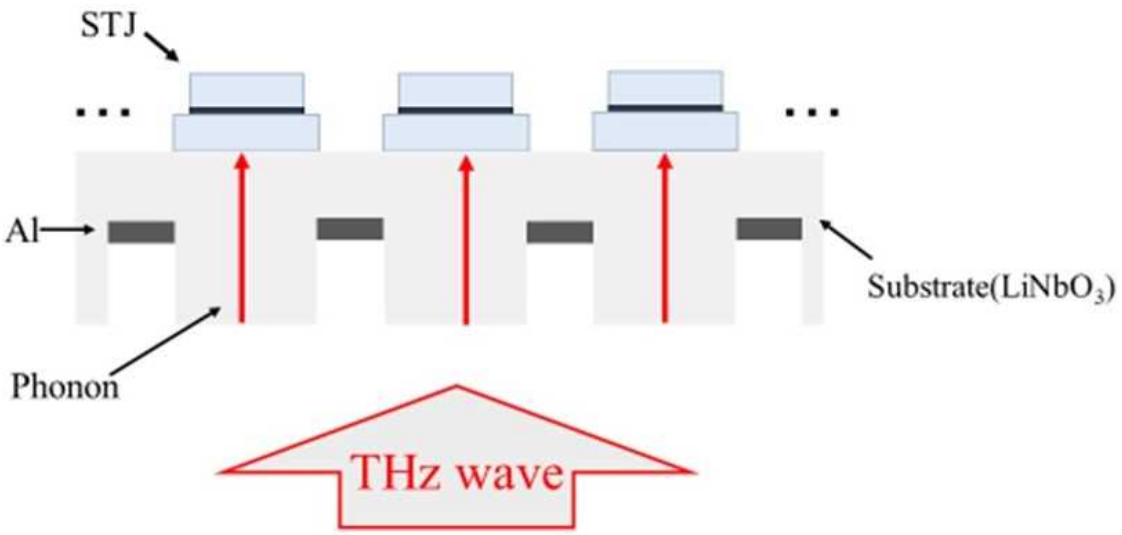

Figure 1. A schematic view of our proposed STJ

Keywords: Superconducting tunnel junctions, Terahertz wave