Bulk Monocrystal Growth by Floating Zone Method and Bismuth-Doped Silicon

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Bismuth (Bi) donors in silicon (Si) have attracted much attention in recent years. Bi donors spin have advantages for quantum information processing because of its long spin coherence time and possibility to couple to superconducting circuits [1, 2].

However, the least solubility of Bi among group V elements makes it hard to dope Si with certain amount of Bi [3]. Only a limited number of reports are available which have studied a bulk single-crystal Bi-doped Si [1,4], while many other studies on Bi donors in Si used Bi ion-implanted Si samples [5].

In this study we are trying to grow bulk monocrystal, isotopically natural Si doped with Bi by using the Floating Zone Method and investigate its electronic and magnetic properties by Hall Effect Measurement and Electron Spin Resonance (ESR). By the same method, isotopically controlled monocrystal Si doped with Bi would be obtained for investigating the utility for quantum information processing.

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