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Purification of germanium crystal by zone-refining technique¹ GANG YANG, JAYESH GOVANI, HAO MEI, GUOJIAN WANG, YUTONG GUAN, Department of Physics, University of South Dakota, Vermillion, SD 57069, USA, CHAOYANG JIANG, Department of Chemistry, University of South Dakota, Vermillion, SD 57069, USA, DONGMING MEI, Department of Physics, University of South Dakota, Vermillion, SD 57069, USA — Zone refining is a purification technique of metal materials, which was developed at Bell Telephone Laboratories in the early of 1950s. In zone-refining of high-purity germanium crystals, the influential factors include vacuum level, container of germanium ingot, ambient gases, speed of zone travel, the ratio of ingot length to molten zone length, etc. In the present work, we have investigated the influences of the following factors on the purification of germanium crystals: graphite/quartz boats, hydrogen/argon gas, speed of zone travel and the ratio of ingot length to molten zone length. Additionally, we have also analyzed the influences of segregation of three main impurities, such as boron, aluminum and phosphor on the electrical properties of the zone-refined crystals. In this paper, we report the results from the zone-refined germanium ingots produced at the University of South Dakota.

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