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XRD analysis of high purity germanium single crystals grown by Czochralsk method GANG YANG, GUOJIAN WANG, WENCHANG XIANG, MUHAMMAD KHIZAR, YUTONG GUAN, YONGCHEN SUN, DONGMING MEI, CHAOYANG JIANG, BRUCE GRAY, University of South Dakota — Two high purity germanium (HPGe) crystals were grown in argon and hydrogen atmosphere by Czochralsk method, respectively. Both XRD 2θ scanning and rocking curve (ω -scanning) were used to investigate the quality of the grown crystals. XRD 2θ scanning results show that an extremely strong (400) peak at 2θ of 66.15° and a very feeble (200) peak at 31.56° were observed in three samples cut from the crystal grown in Ar atmosphere, indicating the crystals with $\langle 100 \rangle$ orientation. However, there is an obvious split on (400) peak for three samples, which could be attributed to defects in the crystal. Additionally, according to the reflection and extinction law of germanium crystal with face-centered cubic lattice, the reflection of 200 should be forbidden. The presence of (200) peak at 31.56° could be resulted from XRD multiple-beams scattering. For the crystal grown in hydrogen atmosphere, only very strong and non-split (400) peak at 2θ of 66.15° was observed in all three samples. The ω -scanning results of two crystals at the fixed 2θ of 66.15° show that the crystal grown in hydrogen atmosphere has much more highly symmetric rocking curve with narrower FWHM, which exhibits that the crystal grown in hydrogen atmosphere has very high quality. This work is supported by DOE grant DE-FG02-10ER46709 and the state of South Dakota.

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