

Effect of doping on global and local order in crystalline GeTe

Xavier Biquard,¹ Milos Krbal,² Alexander V. Kolobov,^{2,3} Paul Fons,^{2,3} Robert E. Simpson,² Berangere Hyot,^{4,*} Bernard Andre,⁴ Junji Tominaga,² and Tomoya Uruga³

¹CEA-INAC, MINATEC Campus, 17 rue des martyrs, F-38054 Grenoble Cedex 9, France

²Nanodevice Innovation Research Center, National Institute of Advanced Industrial Science & Technology, Tsukuba Central 4, Higashi 1-1-1, Tsukuba, Ibaraki, 305-8562, Japan

³Spring8, Japan Synchrotron Radiation Institute (JASRI),

Kouto 1-1-1, Sayo-cho, Sayo-gun, Hyogo 679-5148, Japan

⁴CEA-Leti, MINATEC Campus, 17 rue des martyrs, F-38054 Grenoble Cedex 9, France

* berangere.hyot@cea.fr

ABSTRACT

Effect of nitrogen and carbon doping on the structure of GeTe has been investigated using x-ray diffraction and extended x-ray absorption fine structure (EXAFS) spectroscopies. While Bragg diffraction which probes the global structure exhibits a clear transition upon doping from the rhombohedral phase to the cubic (rocksalt) phase, the local structure probed by EXAFS remains rhombohedrally distorted across the compositions studied. The apparent inconsistency between the results of the two techniques used is attributed to disordering upon doping and the resulting order-disorder transition that is “seen” by site-averaging diffraction as a displacive rhombohedral-to-cubic transition.

Key words: N-doped GeTe, C-doped GeTe, XRD, EXAFS, order-disorder transition