

Direct Comparison of ZnO single crystal grown by the hydrothermal and Pressurized melt growth method

Jigang Yin^a, Yin Hang^{a*}, Lianhan Zhang^a, Guangzhu Chen^a, Kaijie Ning^a, Peixiong Zhang^{a,b},
Zhe Chen^{a,b}, Xiangyong Wang^{a,b}

^a Key Laboratory of High Power Laser Materials, Shanghai Institute of Optics and Fine Mechanics,
Chinese Academy of Sciences, Shanghai 201800, PR China

^b Graduate School of Chinese Academy of Sciences, Beijing 100039, PR China

*Corresponding author: yhang@siom.ac.cn, yjg@siom.ac.cn

Abstract:

Among wide-band-gap semiconductors ZnO is one of the promising materials for the fabrication of UV and visible light emitting devices, which recently attracted particular attention due to its remarkable optical properties. Recently the melt and hydrothermal methods have been successfully used to grow two-inch, and even larger crystals. However, there still remain serious problems with bulk-ZnO crystals. The origin of the green emission in the ZnO is the most important among them. In this paper, a contrastive research was used to investigate the growth of ZnO single crystals grown by the hydrothermal and pressurized melt growth method. The crystals were processed under several annealing conditions and were characterized by photoluminescence spectroscopy (PL), Raman scattering and Electronic paramagnetic resonance (EPR) at room temperature. The origin of a green emission in undoped ZnO is discussed.

References:

- [1] C.J. Lee, T.J. Lee, S.C. Lyu, Y. Zhang, H. Ruh, H.J. Lee, *Appl. Phys. Lett.* **81** (19), 3648-3650 (2002).
- [2] N. Y. Garces, L. Wang, L. Bai, N. C. Giles, L. E. Halliburton, and G. Cantwell, *Appl. Phys. Lett.* **81**, 622 (2002).
- [3] F. H. Leiter, H. R. Alves, A. Hofstaetter, D. M. Hofmann, and B. K. Meyer, *Phys. Stat. Solidi (b)* **226**, R4 (2001).
- [4] V. Avrutin, J.Z. Zhang, J.J. Song, D. Silversmith, Fellow, IEEE, and H. Morkoç, *Bulk ZnO: Current Status, Challenges, and Prospects A brief overview of the recent achievements in mass production of ZnO single crystals* (2009).
- [5] N. Ohashi, T. Ishigaki, N. Okada, T. Sekiguchi, I. Sakaguchi, H. Haneda, *Appl. Phys. Lett.* **80**, 2869 (2002).