Present status of x-ray fluorescence holographic studies at PF-KEK

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Abstract

At the beamline BL6C and BL15B1, we have recently carried out x-ray fluorescence holography (XFH) experiments on several functional materials, such as Shape Memory Alloy, DVD Materials, Ferromagnetic Films, Mixed Semiconducting Alloys, Dirac Insulator Materials. In this presentation, recent status of the XFH technique is introduced together with recent applications.

Recent publications

[1] Extent and feature of lattice distortions around Ga impurity atoms in InSb single crystal, S. Hosokawa, N. Happo, T. Ozaki, H. Ikemoto, T. Shishido, and K. Hayashi, Phys. Rev. B 87, 094104-1-8 (2013)

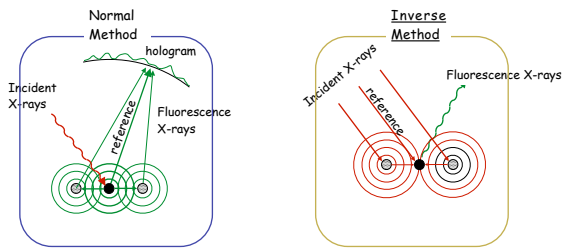
[2] X-ray fluorescence holography, K. Hayashi, N. Happo, S. Hosokawa, W. Hu, and T. Matsushita, J. Phys.: Condens. Matter, (Topical Review) 24, 093201-1-15 (2012)

[3] 蛍光X線ホログラフィーによる局所格子歪みの評価、林好一、八方直久、細川伸也、日本放射光学会誌、印刷中

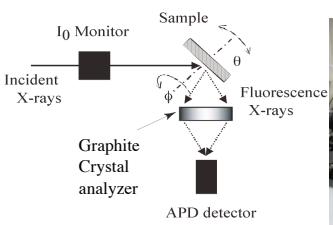
Approved Projects

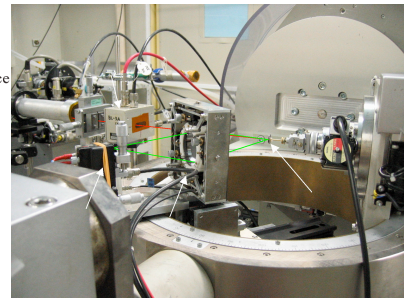
1. 2012G661, Tomoyuki Terai, Ti-Ni-Fe Shape Memory Alloy
2. 2011G530, Shinya Hosokawa, GeSbTe DVD Material
3. 2011G601, Naohisa Happo, Mn:$ZnSnAs_2$ Room-Temperature Ferromagnetic Film
4. 2012G757, Kouichi Hayashi, Low-Temperature Apparatus

Principle of x-ray fluorescence holography

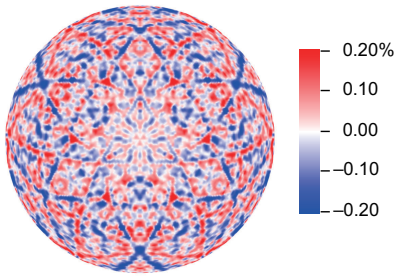


XFH diffractometer installed at BL6C of PF-KEK





Example of Hologram



Hologram pattern obtained from the (111) surface of the InGaSb sample using incident X-rays of 11.0 keV.

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Barton's algorithm

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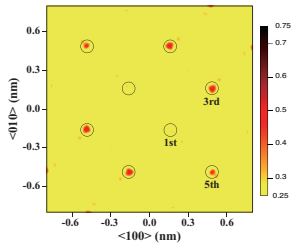
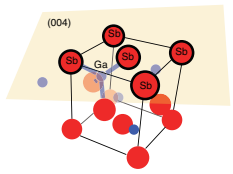
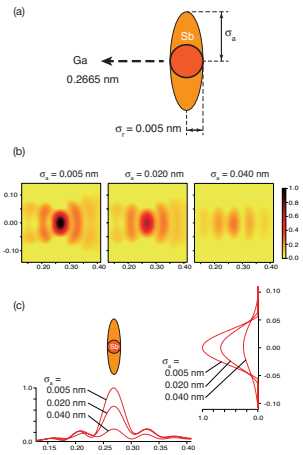
Three-dimensional atomic image

InGaSb Mixed Semiconducting Alloy

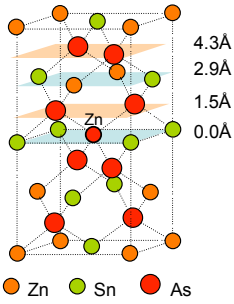
Images of the first-neighboring Sb are too weak? - Disk displace model -





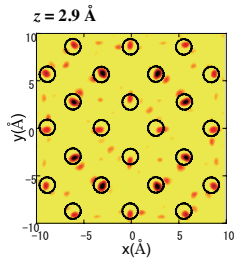


Mn:$ZnSnAs_2$ Room-Temperature Ferromagnetic Film

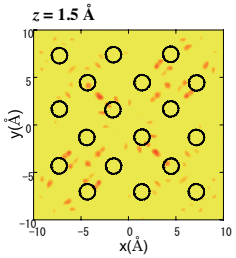


chalcopyrite structure

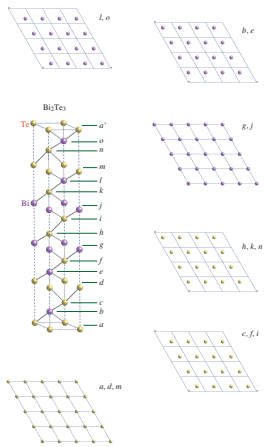
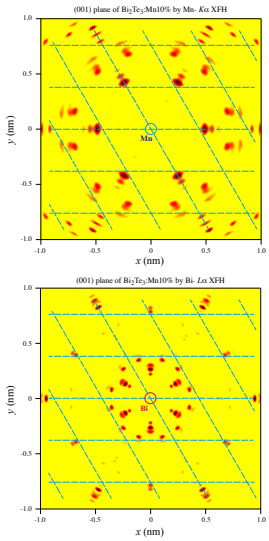
As sites are highly fluctuated?



Cations plane



As plane

Bi_2Te_3:Mn Dirac Insulators

Where are the Mn impurity atoms?