of P_h' is about three times narrower than that of P_h. Fig.2 shows the calculated rocking curves by using Wagner's dynamical theory (Wagner, H. (1956) *Z. Phys.* **146**, 127). The measured rocking curves show excellent agreement with the calculated one. Consequently, the characteristics of P_h, P_h' and P_t' in Bragg-Laue case are reproduced by using the theory.

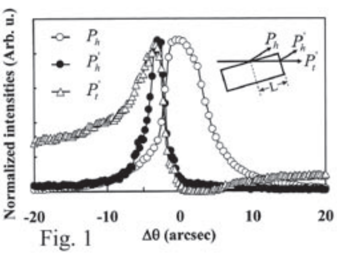

Fig. 1

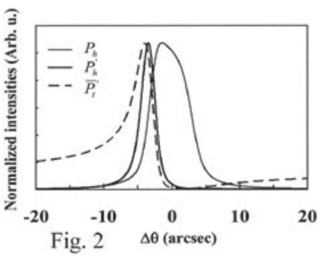

Fig. 2

Keywords: Bragg-Laue case, dynamical diffraction, dynamical X-ray diffraction theory

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Interference fringe in Bragg-(Bragg)^m-Laue case

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The interference fringes of the diffraction from the side surface on the finite thin plane parallel crystal have been observed [1]. This diffraction scheme as shown in Fig.1 may be called as Bragg-(Bragg)^m-Laue case, where the first Bragg means the Bragg case and the second (Bragg) a sequence of "m" times diffractions in the crystal and the last Laue the last diffraction on the side surface. The measured interference fringes of the diffracted X-rays from the side surface are shown by the solid line in Fig.2. We tried to analyze the origin of the interference fringes using the Wagner's dynamical theory [2]. In Fig.1, the X-ray beams from the two courses of S1 and S3 are overlapped each other at $x=b$. The calculated interference fringes shown by the broken lines in Fig.2 excellent agree with the measured one's except the peek at $x=H$. Since the peek at $x=H$ can not produce the interference between two beams of S1 and S3, it peek seems to be obtained by the X-ray confinement effect as pointed out by the reference [3].

[1] Fukamachi, T. et al. (2004,5). JJAP. **43**, L865-867.and **44**, L787-L789.
[2] Wagner, H. (1956). Z. Phys. **146**, 127-168.
[3] Fukamachi, T. et al. (2006). JJAP. **45**, 2830-2832.

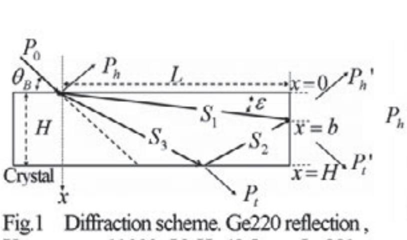

Fig.1 Diffraction scheme. Ge220 reflection, X-ray enagy:11000 eV ,H=43.5 μm ,L=891 μm.

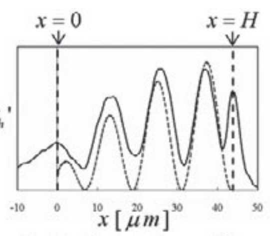

Fig.2 The interference fringes.

Keywords: interference fringe, Bragg case, X-ray confinement effect

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Observation of in-phase interference fringes

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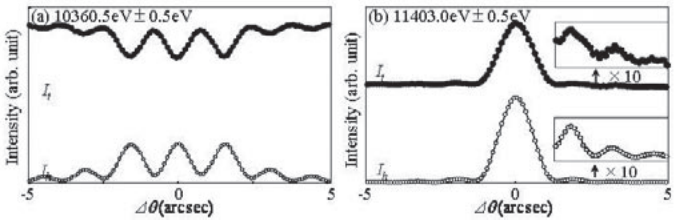
By using X-rays of high angular and energy resolution, we have measured the diffracted and transmitted rocking curves of GaAs 200 reflection near the K-absorption edge of As [1]. X-rays from synchrotron radiation are monochromated by a Si 111 double-crystal monochromator and by an asymmetric GaAs 200 monochromator. The angular resolution of the X-rays after passing the monochromators is 0.23 arcsec. In the figures are shown the diffracted Ih (open circles) and transmitted It (filled circles) rocking curves when the X-ray energy is 10360.5 eV (a) and 11403.0 eV (b), respectively. In (a), well-known Pendellosung fringes that are anti-phase with each other in the diffracted and transmitted waves are observed. In contrast, in (b), the interference fringes are in phase with each other, which is not expected according to conventional theory of diffraction. The insets of (b) show the magnifications of the tail, which show three peaks of the in-phase oscillations. The origin of the in-phase interference fringe is analyzed to be characteristic to the diffraction only by the imaginary part of the atomic scattering factor.

[1] Negishi, R., et al., J. Phys. Soc. Jpn., 2008, 77, 023709.



Keywords: interference fringe, resonant dynamical theory, anomalous scattering factor

P15.08.16

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Anomalously large dispersion angle of refracted wave in Bragg case

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X-rays transmitted from a Ge thin crystal in Bragg case have been observed on a nuclear plate as shown in Fig (b), when the beam intensities from the side surface become maximum. Fig. (a) shows an illustration of geometry in the experiment. The dispersion angle $\delta\theta$ of the incident beam is 0.25 arcsec, and the beam width along the dispersion angle is 20 μm. The width of the observed transmitted beam is 143 μm. Using Wagner`s dynamical theory of diffraction [Wagner H. (1956), Z. Phys. **146**, 120-168.], we have studied why the width of the transmitted beam is so wide. If we choose ε as the angle between the directions of the refracted beam and of the crystal surface as shown in Fig. (a), ε changes from zero to approximately Bragg angle within the angle of $\delta\theta$ in the experiment. When the refracted beams reach at the bottom surface, a part of them come out and are