s4.m1.p1 Influence of ultrasonic vibrations on X-ray fluorescence under dynamical diffraction conditions.
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Keywords: diffraction physics.

A theoretical model of X-ray fluorescence yield in perfect crystal by high frequency ultrasonic vibrations is supposed. The possibilities of the X-ray standing wave method are used basing on the registration of the angular dependence of the intensity of a secondary radiation yield [1,2].

The calculations are based upon the presentation of vibrating crystal as a set of crystalline slides with different interplanar distances [3]. In the present paper the TDS is considered in crystal disturbed by high frequency ultrasonic vibrations. In this case additional X-ray reflexes (satellites) are formed out which can be used for structure investigations. By varying the incident angle one can excite all the satellites each after another and detect the variation in X-ray fluorescence yield. Theoretical analysis is made both in the case of the crystal matrix and the layer of impurity atoms.

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s4.m1.p2 Polarization Suppression of X-ray *Umweg* Multiple Waves in Crystals.
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Keywords: X-ray multiple diffraction, phase problem.

Multiple-wave diffraction has demonstrated its capability of determining the phases of the involved structure-factor multiplets utilizing the coherent dynamical interaction among the multiply diffracted waves. In this way, the phases of individual Bragg reflections can be deduced from the determined multiplets, thus providing a solution to the x-ray phase problem. However, there is a fundamental concern on the visibility of x-ray multiple-wave interaction in crystals, which is also very common in optics. That is, the visibility of the interference effect is low when the amplitudes of the involved multiply diffracted waves are not comparable with each other. In other words, the phase insensitive part of the diffracted intensities plays a dominant role in the diffraction process. Under this circumstance, this multiple-wave phasing technique either provides unreliable phase values or breaks down. To overcome this intrinsic difficulty in multiple-wave interaction, we propose a novel method of enhancing the interference visibility, namely the phase sensitivity, by suppressing the phase insensitive contribution to minimum. This method is based on the newly observed phenomenon of the polarization suppression of x-ray *Umweg* multiple waves in Renninger scans [1] of crystals that shows intensity decrease due to properly chosen wavelength and polarization of incident radiation. That is, one of the participating wave components in the multiple-wave interference is reduced considerably so that the intensity of multiple diffraction is decreased. The condition for total suppression of the multiple-wave interaction in crystals is derived theoretically from Born approximation and verified with exact dynamical calculation and experiments. Using elliptically or linearly polarized synchrotron radiation, partial suppression of the strong *Umweg* interfered component is demonstrated. The suppressed multiple-wave intensity distribution reveals high sensitivity to x-ray reflection phase. This multiple diffraction technique under partial polarization suppression thus provides an alternative way of enhancing the visibility of multiple-wave interference in crystals for direct phase determination.

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