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MOESSBAUER STANDING WAVES IN MULTILAYER STRUCTURE: DEPTH DISTRIBUTION OF HYPERFINE FIELDS

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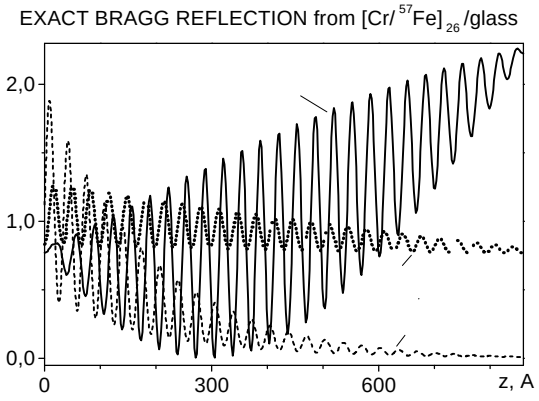
X-ray standing wave technique has been known as the very effective method of structure investigation. Nuclear resonance interaction strongly enhances the standing waves pattern [1]. There are two ways for nuclear resonance investigation: by ordinary radio-active source and by pulsed synchrotron radiation (energy and time-dispersive methods). Energy (Moessbauer) or time spectrum of the radiation field inside periodical resonant multilayer at the Bragg conditions is drastically altered with depth in the scale of one period. So even the nonresonant atoms has a "Moessbauer" spectrum of photoelecton or x-ray fluorescent emission which contains the structural information.



Standing wave behavior is quite different for the two ways of investigation (see Fig.1). The formation of reflectivity signal can be explained from that picture also. It proves that the reflectivity spectra measured in the energy and time domains characterize the different parts of investigated samples. The positions of antinodes are in antiphase for the energy and time-dispersive methods.

So the interaction with resonant layers suppressed for the energy scale of investigation at the exact Bragg angle, but the time spectrum of reflectivity depends predominantly on the hyperfine interaction in central parts of the resonant layers. That was observed in the experiment [2]. The shift from the exact Bragg position (the shift of standing waves antinodes) allows to «scan» over the resonant layer which gives the hyperfine interaction distribution in the interfaces and in the resonant layers.

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