Fine Structure of Bragg's Peak as Dynamical Effect Specifying Nano-Clusters

Michael B. Shevchenko, Oksana V. Pobydaylo, *Institute for Metal Physics, Kiev, Ukraine*. E-mail: mschevchenko@yahoo.com

As is well known, x-ray and electron diffraction is commonly used to investigate the morphology of nano-clusters. It should be noted, one could increase diagnostic capabilities of these techniques by studying the fine features of diffraction phenomena. In this connection, we refer to effect resulting in the splitting of the x-ray Bragg's peak related to fcc lattice [1]. This happens after the plastic deformation of the lattice, such that icosahedral nano-clusters occur in fcc crystal. At the same time, the transformation of a cuboctahedron to a regular icosahedron induces strong distortion fields in the crystal. Using the diffraction data, we could establish that such fields are able to cause the x-ray interbranch resonance [2], observed as the fine structure effect. Assuming elastic distortions, we calculate the resonance splitting of rocking curve, which equals to inverse length of the x-ray interbranch extinction and is in line with the experimental results.

The approach presented in the work can be also useful for high-energy electrons. As was reported [3], the similar fine structure of Bragg's peak appears in the case of electron diffraction with strained nano-clusters.

[1] Chmelevskaya V.S., et. al., *Russian Surface*, 1998, **N6**, 95. [2] Shevchenko M.B., *Acta Cryst*., 2003, **A59**, 481. [3] Reinhard D., et. al., *Phys. Rev. B*, 1997, **55**, 7868.

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