CONCERNING THE SUBJECT OF X-RAY SCATTERING BY LARGE DISLOCATION LOOPS

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S u m m a r y

The effect of large dislocation loops (exceeding the extinction distance) on X-ray diffuse scattering in GaAs crystals heavily (up to 10^{18} ,‡ $^{-3}$) doped by silicon is investigated both theoretically and experimentally. Measurements of Bragg rocking diffraction curves are carried out by a three-crystal diffractometer adjusted in the $(n,-n,+m)$ case. In addition, the tails of diffuse components of the intensity in the Huang as well as in the Stocks – Wilson regions are analyzed, which allowed us to obtain the independent data concerning the radii r of lagre dislocation loops ($r = 12$ μm). Their dimensions happened to be somewhat smaller as comparing with the data obtained by the Lang diffraction topographical method. This method gave the average radius of loops $r = 30 \div 100$ μm and their approximate concentration $c = 5.3 \cdot 10^{6}$,‡ $^{-3}$. The fitting procedure based on the Molodkin statiscal dynamical theory describing X-ray scattering by large dislocation loops is used to adjust the calculated values of the differential intensities to experimental data. This approach gave the following values of microdefects : $r = 2.39$ μm and $c = 10^{4}$ cm $^{-3}$. The idea of the existence of nonreflective regions on large dislocation loops is used to obtain a qualitative agreement between the experimental and calculated values of the intensities.