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A Study on the Recovery of Heavily Faulted Cu–Ge Single Crystals by X-ray Diffraction

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X-ray diffraction profiles have previously been examined for individual crystals in deformed Cu–11 wt.% Ge alloy. Diffuse streaks with two broad peaks instead of one sharp reflexion were diffracted from 'heavily faulted regions' in the deformed specimen. The faulted state has been well explained by Kakinoki's theory [Kakinoki, J. (1967). *Acta Cryst.* **23**, 875–885] with 'Reichweite' $s=2$, having particular fault probabilities, for example, $\alpha_1 \sim 0{\cdot}5$ and $\alpha_2 \sim 0$ [Takama, Yokota & Sato (1974). Submitted to *J. Appl. Cryst.*]. In the present experiment, the stability of the heavily faulted state has been investigated by the same technique. At temperatures higher than 300°C, remarkable redistributions of peak intensities on the streak were observed in addition to the decrease in the total diffuse intensity. It has been revealed that the following variations in stacking order occur during annealing:

*AB*A random stacking in *AB*C regular stacking
↓ *AB*AC random stacking in *AB*CA regular stacking.
↓ *ABAC* regular, *AB* regular and *CBA* regular stackings.

The first change corresponds to the reaction in which the intrinsic stacking faults come together on successive layers to form the extrinsic stacking fault. The later changes will be understood as the local formations of transient stable stackings which appear during the course of recovery. It is noted that a monotonic decrease in random fault density has never been observed.

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Interpretation of X-ray Scattering Patterns due to Periodic Structural Fluctuations

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If the parameters of a structure are modulated by a periodic function, satellite reflexions are observed as well as the main reflexions in single-crystal X-ray photographs. Basically such modulation can be due to a periodic variation of the scattering density or of the positional parameters. The periodic fluctuation of atomic positions can either be a longitudinal or a transverse wave. This paper deals with longitudinal and transverse periodic fluctuations of atomic position. The coherently scattered X-ray intensity is calculated for two types of modulating functions: (1) A rectangular wave: This type of modulation may be conceived for structures with domain-like antiparallel shifts of atomic positions. (*e.g.* in antiferroelectrics). (2) A triangular wave: Some type of micro-twinning can be described as a transverse triangular modulation of the structure. For these two types of lattice modulations the characteristic features of scattering patterns are discussed as to determine the type of the modulating function and its parameters (wavelength, amplitude). These results are compared with those published by Korekawa, M. [*Theorie der Satellitenreflexe.* (1967). Habilitationsschrift der Ludwig–Maximilian-Universität München] for sinusoidal type modulations.