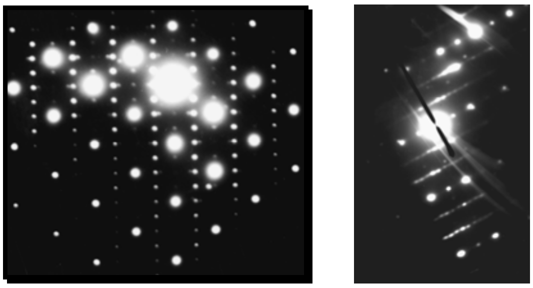

a b

Fig. 3: a- $[0\bar{1}1]_c$ *diffraction pattern of* V_8C_7 *superlattice. b -* $[11\bar{2}]_c$ *diffraction patterns of* V_6C_5 *superlattice.*

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On formation of curved kikuchi lines

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Keywords: electron, diffraction, crystal.

In our previous report [1] about the curved Kikuchi lines in the transmission diffraction patterns from silicon was concluded that the curvature of the Kikuchi lines is conditioned by the presence of the limited defects in the investigated specimens. In the present report this curvature is explained within the framework of the Kikuchi patterns formation elementary mechanism [2] with due regard for the Kikuchi electron double diffraction. In this case the diffracted electron beams contribute to the formation of the Kikuchi patterns, for example, to the appearance of the forbidden and unindexed Kikuchi lines [3], as well as to the enhancement and to the contrast reversal of Kikuchi lines [4,5]. It is founded that as distinct from the specimens giving the straight lines, when the primary electron beam forms the Kikuchi lines at full length, in the case of the curved Kikuchi lines the primary electron beam does not form the Kikuchi lines at full length, and forms only the segments positioned in the vicinity of the perpendicular drawn from the zero spot to the given pair of the Kikuchi lines. Similarly, the diffracted beams also form only the segments disposed in the vicinity of the perpendiculars drawn from the corresponding spots to the same Kikuchi lines. It is obtained that as the Kikuchi lines are rigidly attached to the spots [2], any displacement of the spots from their normal position leads to the corresponding displacement of lines segment conditioned by these spot reflections. The different displacements of the diffracted spots situated along the Kikuchi lines are revealed. The displacements are increased in the segments, which are more distant from the zero spot. The corresponding changing of the location of the Kikuchi line segments is obtained. The curved Kikuchi lines are formed in consequence of the join of the separate segments displaced from each other. The direction of the line curvature depends on the direction of the spots displacement. The continuity of the Kikuchi lines is due to the continuous distribution of the inelastic scattered electrons forming the Kikuchi lines.

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In situ TEM study of the domain evolution in Pb(Zr,Ti)O_3 under electric field

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The microstructure and especially the domain configuration have an important influence on the properties of ferroelectrics. Lead zirconate titanate (Pb(Zr,Ti)O_3) is one of the most prominent ferroelectrics due to its excellent properties near the morphotropic phase boundary. Under cyclic load, however, the material exhibits considerable fatigue which seems to be closely related to the domain configuration.
We have performed *in situ* transmission electron microscopic investigations under electric field in order to elucidate this correlation further. Electrode geometry for a modified TEM heating holder was developed, to apply voltage and thus an electric field to the specimen.
The microscopic reaction was examined on specimen of the morphotropic phase with an composition $Pb(Zr_{1-x},Ti_x)O_3$ between x=47.5 and x=44.
In the examined voltage range only a small change of the domain configuration was observed, but the contrast in the microdomains responded to the applied field. This indicates a change in the internal domain structure. In samples with composition $Pb(Zr_{0.54}Ti_{0.46})O_3$ these modifications are related to nanodomains, which are known for these compositions [1]. A change in nanodomain morphology was recognisable. Observations on other compositions strongly support this conclusion.

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