TIME-RESOLVED X-RAY DIFFRACTION OF THE KINETICS OF TEXTURE FORMATION IN THE C49-C54 $TiSi_2$ PHASE TRANSFORMATION

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The transformation from the C49 to the C54 phase in $TiSi_2$ thin films has been studied for more than a decade because of its importance to the semiconductor industry. In this study three dominant C54 orientations have been identified in $TiSi_2$ thin films on Si(001) substrates using x-ray pole figure analysis. The evolution of the three prominent C54 texture components was further examined using synchrotron based time-resolved *in-situ* x-ray diffraction. These experiments utilized an annealing chamber with a hemispherical beryllium window mounted on a four-circle diffractometer and a CCD area detector, which made it possible to observe the development of the complicated C54 texturing.

The kinetics results showed significant differences in the growth of the individual orientations. Simulations suggested that this could be explained by inhomogeneities in the nucleation and growth of different texture components. Classical Johnson-Mehl-Avrami-Kolmogorov (JMAK) analysis of nucleation and growth was applied to model the C49-C54 phase transformation kinetics for each C54 orientation. These results showed a decrease of the Avrami exponent, *n*, from 3 to 2 as a function of annealing temperature. Within a JMAK approach this could be explained by the presence of a limited number of C54 nucleation sites.