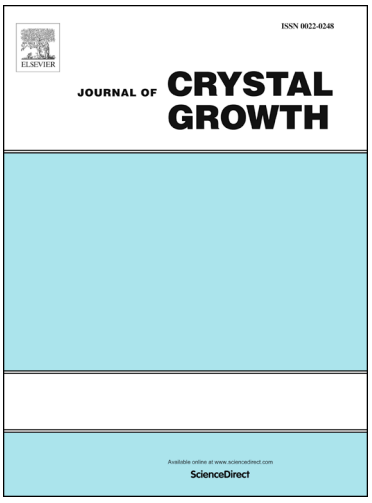

X-ray characterization technique for the assessment of surface damage in GaN wafers

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X-ray characterization technique for the assessment of surface damage in GaN wafers

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SixPoint Materials has successfully switched to production of two-inch diameter GaN wafers using the ammonothermal method. Crystal quality values are high with dislocation densities typically in the low 10^5 cm^{-2}. In efforts to produce true epi-ready material, investigations were made to develop a technique to study surface damage caused by the back-end process using X-ray diffraction methods. Analysis of peak tailing from X-ray rocking curves of the (114) reflection indicates the progression of surface damage during each step of the back-end process. For instance, the tailing can be partially represented using full width five thousand max (FW5000M) values. By using a peak with a low glancing angle, such as the (114) reflection's angle of 10.8662°, more of the X-ray beam is scattered in the surface region, providing an improved measurement of surface damage. Since this technique is non-destructive and can be performed without dismounting the sample from its ceramic back-end processing plate, it can provide information on the damaged layer at each stage of the back-end process. Using this technique to evaluate samples from various manufacturers, we found a lack of uniformity in surface damage from GaN companies. It is our hope that this technique will be adopted to better standardize surface damage measurements in the GaN field.

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