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Stress analysis of sapphire wafer under the straight-through form using Mueller-matrix ellipsometer**Changcai Cui, Jiahua Yu and Jing Lu**
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In the semiconductor chip and integrated circuit manufacturing industry, sapphire is widely used due to its excellent optical and electrical properties. Residual stress, as an important indicator of the processing quality of sapphire wafers, will affect its optical properties such as transmittance and refractive index. It may also cause deformation and cracking of the wafer during subsequent processing. Therefore, the control of the residual stress is particularly important and accurate detection methods are essential. The Mueller-matrix ellipsometer is a new tool for high-precision and non-destructive testing of residual stress. In the straight-through mode of the ellipsometer, the polarization state changes before and after the light incident sample are analyzed. The 16 Mueller-matrix elements of the sample can be obtained in one measurement. The birefringence phase difference of the sample can be calculated by the Mueller-matrix element and then the stress birefringence of the sample can be obtained. Based on the stress optical law, the residual stress can be calculated. In this study, the residual stress measurement of the 4-inch polished c-plane sapphire is carried out under the straight-through formula of the Mueller-matrix ellipsometer. The experimentally measured stress birefringence phase difference can reach 0.1° , which enables fast, non-contact, non-destructive measurement of sapphire wafer stress.

Biography

Changcai Cui has completed her PhD from Harbin Institute of Technology. She is currently working as the Vice Dean of the Institute of Manufacturing Engineering of Huaqiao University. She has published more than 70 papers in journals and conferences and has been a corresponding reviewer of some journals.

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