TECHNISCHE UNIVERSITÄT DRESDEN

IFW

Research topic for a thesis

Stress in multilayered thin film due to the deposition and operational conditions

Multilayer thin-film systems are essential elements of microelectromechanical systems. During operation, variations of temperature-induced stresses occur in the film layers due to the mismatch of their thermal expansion coefficients, cf. Fig. 1. Moreover, exposure for a long time to high-temperature results in other stress-related phenomena such as creep, phase transformation, sintering, etc. The evolution of the stress within thin-film systems can cause damage and fracture phenomena such as delamination, interface cracks, surface cracks, etc., as well as measurement errors of sensors.

In a current project in collaboration with Leibniz IFW-Dresden, a method for the calculation of stresses in a multilayered thin-film at high temperatures on an anisotropic substrate is developed based on measuring the sample curvature using a multibeam optical sensor device (Fig. 2).

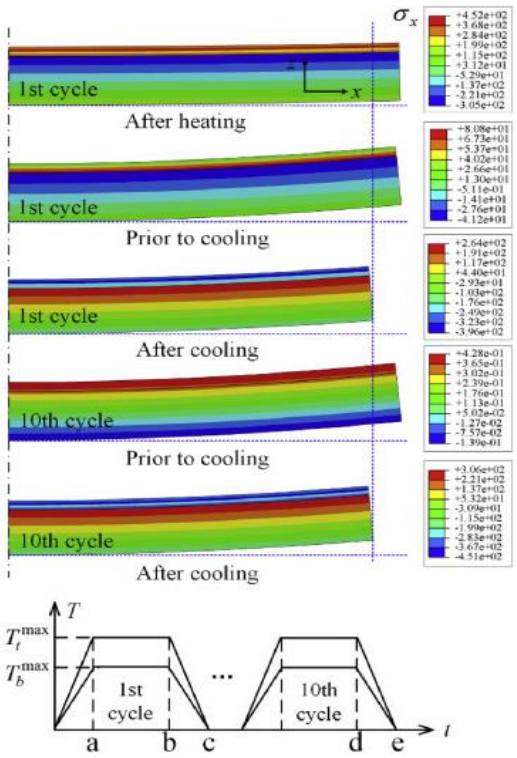

***Fig. 1**: FE predictions of stress contours during thermal cycling (*B. Li, et al., International Journal of Mechanical Sciences, 135, 2018.*

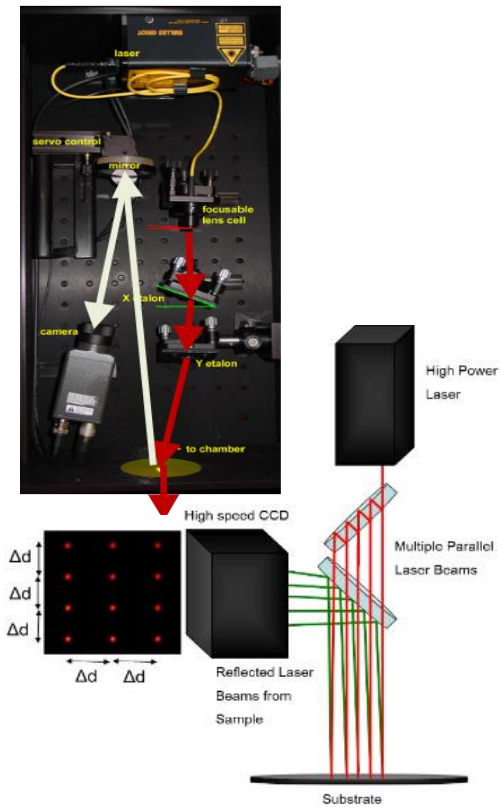

***Fig. 2**: Multibeam optical sensor for the measurement of 2D curvature of sample.*

Within this framework, we are offering a thesis topic for interested students from the field of mechanical engineering. As part of a highly interdisciplinary team and with professional guidance, you will be able to learn about the preparation methods of thin films as well as experimental methods for the acquisition of stress in thin films under thermal cycling and creep conditions. In addition to the thesis work, an accompanying, paid student assistant (SHK) position can be offered within the group up to a maximum of 10hrs/week.

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