

Residual Stress Measurement of Thermal Barrier Coatings

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Summary

Thermal barrier coatings (TBCs) are widely used in turbines for propulsion and power generation. During build up the coatings, the continuity of the strain at the interface results in the residual stress because of the thermal expansion misfit. Since the formation of residual stresses cannot be avoided, they have to be optimized by adaptation of the process parameters during coating manufacturing. Therefore, in order to obtain information about the characterization of residual stresses for specific process conditions, the development of residual stress measurement is of vital importance.

In this paper, several techniques on residual stress measurement are reviewed, including X-ray diffraction (XRD), strip curvature and photo-luminescence piezo-spectroscopy (PLPS). The measurement principles and experimental techniques of these methods are described in detail. In addition, the hole drilling with moirAC interferometry, which have been recently developed at AML in Tsinghua University, are also introduced. Some typical applications to these methods are discussed. The successful experimental results demonstrate the feasibility of these methods and also verify that the methods can offer a high sensitivity for displacement measurement.

