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# Reliable measurement of mechanical TBC properties for quality control and life prediction

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**RELIABLE MEASUREMENT OF MECHANICAL TBC PROPERTIES FOR QUALITY CONTROL AND LIFE PREDICTION**

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Modern thermal barrier coating systems (TBCs) with advanced bond strength and thick ceramic top coatings generally fail within the ceramic due to the high thermal gradients and transients they experience during service. A detailed knowledge of the thermal and mechanical material properties is a prerequisite to understand the life limiting mechanisms and predict the reliability and performance of TBCs under operating conditions. In the talk we focus on commercially air plasma sprayed TBCs with material composition, thicknesses and porosities equivalent to those used for blades and vanes of industrial gas turbines. We present suitable preparation and measurement procedures to determine the mechanical key properties such as Young's modulus (E) and critical energy release rate ($G_{Ic}$). TBC top coat samples were annealed both free-standing and attached to ceramic substrates in order to investigate the effect of sinter constraint. Additionally we characterized samples taken from an engine component after 6000 hours of operation. A Larson-Miller master curve approach was found to provide an efficient way of representing the data as function of sintering temperature and time and may be used as the input format for TBC life prediction models.

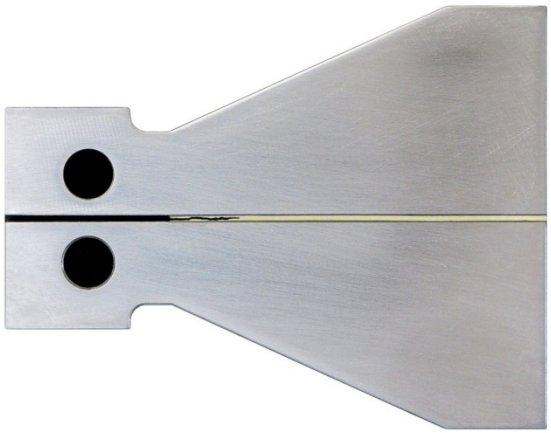

*Figure 1 – Tapered DCB specimen with an APS YSZ coating for measurement of $G_{Ic}$*