**Advances in Raman Microscopy – High-resolution Investigation of Residual Stresses in Polycrystalline Materials**

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Raman microscopy is a fast and non-destructive material behaviour identification and characterisation technique. It is based on the Raman Effect results from the inelastic excitation light by the molecules of materials. The interaction of molecule with photons causes vibrations of chemical bonds, leading to energy shifts in the scattered light that can be identified in its Raman spectrum. Any given material behaviour can be easily identified by this individual spectral information.

Reliability of components is influenced by residual stresses represent a stored mechanical energy formed during production and machining operation, which can act as driving force for crack growth, fatigue and mechanical failure. The investigation described reveals that stress profile measurement in materials are of great importance in fields of application such as nuclear material research, microplastics and microelectronics research, pharmaceutical research and many others.

Graphite materials are well-known carbon allotrope in which two-dimensional structures of basal (graphene) planes are held together by weak dispersion forces forming the bulk graphite structure. The material properties of commercial graphite grades are complex and dependent on the graphite microstructures. Different graphite grades differ in microstructure and the material property changes from one grade to another. The present work aims to quantitively characterize residual stress gradients across polycrystalline graphite phases in order to understand the major driving force for the failure and to understand the correlation between the microstructure and residual stress gradients in graphite.