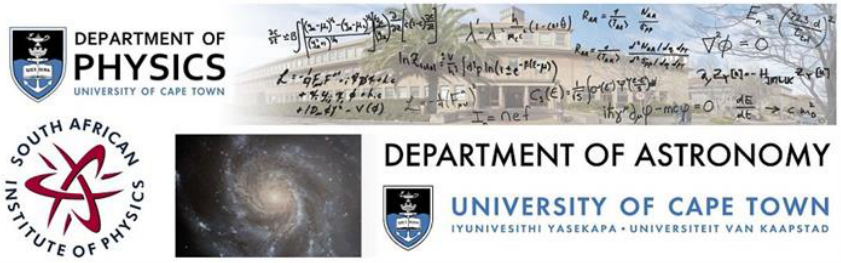

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Residual stress measurements in leached polycrystalline diamond using X-ray diffraction and Raman spectroscopy techniques

Wednesday, 6 July 2016 10:00 (20 minutes)

Abstract content
   (Max 300 words)
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It is widely believed that the presence of cobalt in polycrystalline diamond compacts (PCD) makes them have limited heat resistance and causes graphitisation. The cobalt binder also influences the residual stresses in the PCD compacts and therefore the removal of the cobalt certainly alters the residual stresses present especially on the surface. A systematic investigation and evaluation of the average in-plane residual stress fields on the surface of a number of leached PCD tool bits was conducted using two complementary non-destructive techniques namely; X-ray diffraction and Raman spectroscopy. The Raman peak reveals both the nature and magnitude of the stress present in the material but it is essentially a surface technique with the depth penetration of the visible light being limited by the transparency of the PCD to only a few microns. The X-ray Diffraction technique probes the change in the spacing of the atomic planes of the diamond crystals with strain and has a larger penetration depth. Fatigue measurements were conducted under constant amplitude loading at a frequency of 4 Hz. The 514.5 nm line of the Ar+ ion laser was used as an excitation source and measured results from both the X-ray diffraction and the Raman techniques two are quite comparable with average compressive residual stresses in the range of 220 to 450 MPa being observed.

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