

The R8-BC8 Phases and Crystal Growth in Monocrystalline Silicon under Microindentation with a Spherical Indenter

I. Zarudi, L.C. Zhang¹

School of Aerospace, Mechanical and Mechatronic Engineering, The University of Sydney, NSW 2006, Australia

J. Zou

Division of Materials and Centre for Microscopy and Microanalysis, The University of Queensland, QLD 4047 and Australian Key Centre for Microscopy and Microanalysis and Electron Microscope Unit, The University of Sydney, NSW 2006, Australia

T. Vodenitcharova

School of Aerospace, Mechanical and Mechatronic Engineering, The University of Sydney, NSW 2006, Australia

Abstract

The morphology and distribution of high-pressure metastable phases, BC8 and R8, formed in monocrystalline silicon under microindentation were identified and assessed by means of the TEM nano-diffraction analysis. It was discovered that the crystal growth inside the transformation zone was stress-dependent with large crystals in its central region. The crystal size could also be increased by higher maximum indentation loads. The BC8 and R8 phases distributed unevenly across the transformation zone, with BC8 crystals mainly in the centre of the zone and smaller R8 fragments in the peripheral regions. Such phase distribution was in good agreement with the theoretical residual stress analysis.

¹ zhang@aeromech.usyd.edu.au