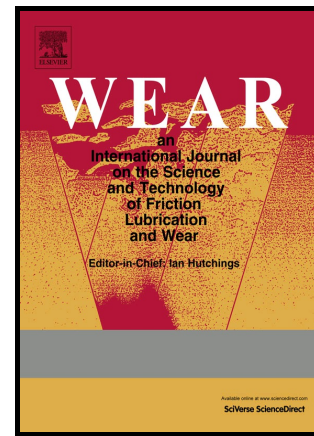


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Surface damage mechanism of monocrystalline silicon during single point diamond grinding

Quanli Zhang^{1*}, Yucan Fu¹, Honghua Su¹, Qingliang Zhao² and Suet To³

¹ College of Mechanical and Electrical Engineering, Nanjing University of Aeronautics and Astronautics, Nanjing

210016, China

² Centre for Precision Engineering, School of Mechatronics Engineering, Harbin Institute of Technology, Harbin,

150001, China

³ State Key Laboratory of Ultra-precision Machining Technology, The Hong Kong Polytechnic University, Hong

Kong

*Corresponding Author / E-mail: zhangql606@163.com, TEL: +025-84895857, FAX: +025-84895857

Abstract

Surface damage mechanism of single crystalline Si (100) under single point diamond grinding was investigated in the present study. The result, for the first time, showed that the ductile and brittle material removal appeared at different grinding positions of the diamond wheel due to the varied kinematics of the diamond grits in the cylindrical face and end face. Under the dynamic pressure of the diamond grits, amorphization and the transformation to high pressure phases (Si-III and Si-XI) of Si occurred, which were identified by both XRD and Raman spectroscopy. In addition, surface oxidation and chemical reaction between the Si, O, C and N atoms was analyzed by the XPS, and the new products of Si₃N₄ and graphite oxide (GO) are firstly proposed to be the surface damage of Si and the tool wear mechanism during the ultra-precision machining process.

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