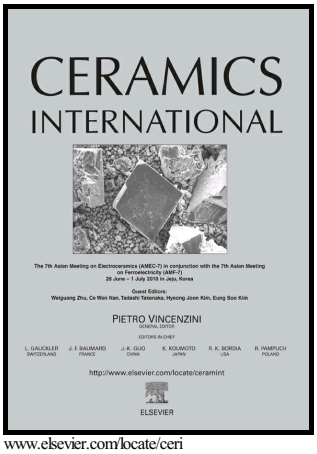

www.elsevier.com/locate/ceri

Removal mechanism of sapphire substrates (0001, 11$\bar{2}$0 and 10$\bar{1}$0) in mechanical planarization machining

Qiufa Luo, Jing Lu, Xipeng Xu, Feng Jiang

PII: S0272-8842(17)31867-9
DOI: http://dx.doi.org/10.1016/j.ceramint.2017.08.194
Reference: CERI16148

To appear in: *Ceramics International*

Received date: 26 July 2017
Revised date: 9 August 2017
Accepted date: 25 August 2017

Cite this article as: Qiufa Luo, Jing Lu, Xipeng Xu and Feng Jiang, Removal mechanism of sapphire substrates (0001, 11$\bar{2}$0 and 10$\bar{1}$0) in mechanical planarization machining, *Ceramics International,* http://dx.doi.org/10.1016/j.ceramint.2017.08.194

Removal mechanism of sapphire substrates (0001, $11\bar{2}0$ and $10\bar{1}0$) in mechanical planarization machining

Qiufa Luo[a,b], Jing Lu[a,b,*], Xipeng Xu[a,b], Feng Jiang[a,b]

[a] Institute of Manufacturing Engineering, Huaqiao University, Xiamen, 361021, Fujian Province, P.R. China

[b] MOE Engineering Research Center for Brittle Materials Machining, Huaqiao University, Xiamen, 361021, P.R. China

Abstract

The mechanical planarization machining of sapphire substrates including the C-(0001), A- ($11\bar{2}0$), and M- ($10\bar{1}0$) orientations with the sol-gel (SG) polishing pad has been performed in this paper. The polishing results show that the C-orientation with a surface roughness about 2 nm is smoother than the A- and M-orientations, and the material removal rate (MRR) of C-orientation is higher than that of them. The removal mechanism of sapphire substrate was investigated by the wear debris and subsurface structure through transmission electron microscopy (TEM). And the instrumented nanomechanical tests were applied to further reveal the removal mechanism by nanoindentation. The analysis results indicate that the variation tendency of MRRs depends on the crystalline structure and nanomechanical properties of sapphire substrates. In addition, the processing of sapphire substrates is mainly dominated by the mechanical removal sapphire material during mechanical

* Corresponding author. E-mail: lujing26@hqu.edu.cn (Jing Lu).
Tel.: +8613055510552; fax: +865926162359.