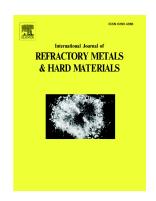
Accepted Manuscript

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PII: S0263-4368(18)30515-8

DOI: doi:10.1016/j.ijrmhm.2018.09.015

Reference: RMHM 4797

To appear in: International Journal of Refractory Metals and Hard Materials

Received date: 6 August 2018
Revised date: 18 September 2018
Accepted date: 27 September 2018

Please cite this article as: Jiang Shi, Feng He, Junlin Xie, Xiaoqing Liu, Hu Yang, Effect of heat treatments on the Li2O-Al2O3-SiO2-B2O3-BaO glass-ceramic bond and the glass-ceramic bond cBN grinding tools. Rmhm (2018), doi:10.1016/j.ijrmhm.2018.09.015

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ACCEPTED MANUSCRIPT

Effect of heat treatments on the Li₂O-Al₂O₃-SiO₂-B₂O₃-BaO

glass-ceramic bond and the glass-ceramic bond cBN grinding tools

Jiang Shi a,b , Feng He a,b,* , Junlin Xie a,b , Xiaoqing Liu c , Hu Yang b

^a State Key Laboratory of Silicate Materials for Architectures, Wuhan University of Technology, Wuhan 430070, China

^b School of Materials Science and Engineering, Wuhan University of Technology, Wuhan 430070, China

^c Center for Materials Research and Analysis, Wuhan University of Technology, Wuhan 430070, China

Abstract: Influence of heat treatments on the Li₂O-Al₂O₃-SiO₂-B₂O₃-BaO glass-ceramic bond and the

glass-ceramic bond cBN grinding tools had been methodically discussed. The results revealed that the

different heat treatments mainly varied the content of LiAlSi₂O₆ and LiAlSi₃O₈ in the glass-ceramic bonds

which in turn resulted in the variation of bonds' CTE and affected the performance of glass-ceramic bond

cBN grinding tools in bending strength. In addition, results of XPS indicated chemical bonds such as N-Al,

N-Si, and N-Li bonds were generated at the interface between the bonds and cBN abrasives during the

sintering process, which acted as a vital part in improving the holding power for the bonding of

glass-ceramic bonds and cBN abrasives. In this study, glass-ceramic bond cBN grinding tools sintered at

860 °C for 120 min presented the highest bending strength (89.71 MPa) with the highest potential for high

performance grinding tools among all the samples.

Keywords: Heat treatments; Glass-ceramic bond; cBN; Mechanical property; Chemical bonds

1 Introduction

Cubic boron nitride (cBN) is a diamond structured compound [1], which boasts high hardness, higher

thermal stability [2, 3] and chemical stability than diamond [4, 5]. Besides, considering its relatively high

^{*} Author to whom correspondence should be addressed. e-mail: he-feng2002@163.com

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