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Effect of heat treatments on the Li_2O-Al_2O_3-SiO_2-B_2O_3-BaO glass-ceramic bond and the glass-ceramic bond cBN grinding tools

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Abstract: Influence of heat treatments on the Li_2O-Al_2O_3-SiO_2-B_2O_3-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 $LiAlSi_2O_6$ and $LiAlSi_3O_8$ 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 ℃ 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

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