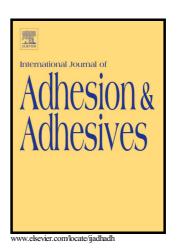
Author's Accepted Manuscript

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PII: S0143-7496(18)30218-5

DOI: https://doi.org/10.1016/j.ijadhadh.2018.09.014

Reference: JAAD2271

To appear in: International Journal of Adhesion and Adhesives

Accepted date: 20 September 2018

Cite this article as: Lege Wang, You-Fen Li, Shi-Hai You, Liangliang Sun and Yaoyao Tong, A self-healing strategy for inorganic fillers: Toward practical applications of silicone resin treated at high temperatures for bonding ceramic j o i n t s , *International Journal of Adhesion and Adhesives*, https://doi.org/10.1016/j.ijadhadh.2018.09.014

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ACCEPTED MANUSCRIPT

A self-healing strategy for inorganic fillers: Toward practical applications of silicone resin treated at high temperatures for bonding ceramic joints

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Abstract

A high-temperature adhesive composed of a silicone resin (SR) matrix was prepared for bonding ceramic joints. The adhesive primarily consists of boehmite sol as the modifier and B₄C, Al and fumed SiO₂ powders as inorganic fillers. In this study, the ceramic yield of the adhesive was determined to reach 138 % after heat treatment at 1100 °C. The bonding strength of ceramic joints heated at 200 °C was measured as 6.25 MPa and increased to 41.67 MPa after heat treatment at 1000 °C. According to mechanistic analysis, the volume shrinkage induced by the pyrolysis of SR was effectively restrained, and the micro-pores and cracks resulting from the oxidation process of the inorganic fillers can be self-healed by introducing borate. In addition, chemical bonds were introduced at the interfaces, thereby further improving the adhesive strength at elevated temperatures.

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