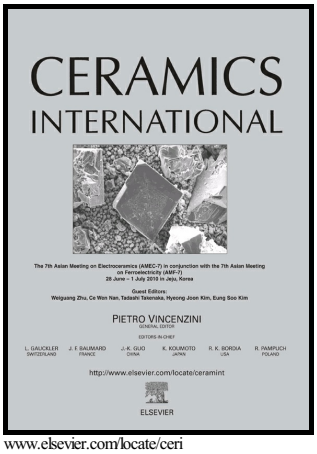

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PII: S0272-8842(18)30679-5
DOI: https://doi.org/10.1016/j.ceramint.2018.03.112
Reference: CERI17749

To appear in: *Ceramics International*

Received date: 14 February 2018
Revised date: 10 March 2018
Accepted date: 13 March 2018

Cite this article as: Li Yin and Mark Ian Jones, The formation and properties of Sialon-ZrN composites produced by reaction bonding combined with post gas-pressure sintering, *Ceramics International,* https://doi.org/10.1016/j.ceramint.2018.03.112

The formation and properties of Sialon-ZrN composites produced by reaction bonding combined with post gas-pressure sintering

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Abstract

Sialon-ZrN composites have been fabricated by a combination of reaction bonding and post-gas-pressure sintering. Composites with different amount of ZrN were post sintered at 1600, 1700 and 1800 °C under a nitrogen pressure of 0.7 MPa for 6h. The results showed that mass loss due to decomposition increased with increasing sintering temperature. The mass loss at 1600 and 1700 °C was comparable, and below 3% even for the highest ZrN content of 50 wt%, but ranged between 6-9% for samples post sintered at 1800 °C with 10-50 wt% ZrN. Composites sintered at 1700 °C had the highest relative density (>97%) and lowest open porosity (<2%), and this was independent of ZrN content. The incorporation of the ZrN particles was observed to have an effect on the mechanical properties of the composites. The highest hardness (16.05±0.17 GPa) was observed for the composite sintered at 1700 °C with 20 wt% ZrN but decreased with higher ZrN contents, due to a weak bonding between the ZrN particles and the Sialon matrix. The fracture toughness showed a continuous increase with