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Fabrication of unidirectional continuous fiber-reinforced mullite matrix composite with excellent mechanical property

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Abstract

This article reports the fabrication of continuous fiber reinforced mullite matrix composite via layer-by-layer assembly method, involving the coating of mullite fiber with BN coating, followed by compositing the coated fibers with mullite matrix and hot pressing. The influences of the fiber coating, fiber content and sintering temperature on the microstructure and mechanical properties of the composite are investigated. By optimizing the sintering temperature and fiber content, the damage of fiber could be avoided and the microstructure and mechanical properties could be improved. The composite containing 30 vol.% fibers coated by BN layer sintered at 1300 °C exhibits 90.9% theoretical density with flexural strength value of 203.2 MPa and fracture toughness value of 4.74 MPa•m^{1/2}. Fracture behavior is investigated to explain the toughening mechanisms. The layer-by-layer assembly method realizes the achievement of an individual architecture featuring fibers distribution and weak interfaces.

Keywords: Ceramic composites; Mechanical properties; Fiber; Microstructure.

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