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[Image PDF (652K)] [References]

Non-linear Finite Element Analysis of the Failure Progression of Fiber-reinforced Ceramics Produced by Tape Casting Technique

Yasuhiro TANIMOTO[1)], Tohru HAYAKAWA[1)], Kimiya NEMOTO[1)] and Tsuyoshi NISHIWAKI[2)]

1) Department of Dental Biomaterials, Research Institute of Oral Science, Nihon University School of Dentistry at Matsudo
2) Research and Development Department, ASICS Corporation

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Abstract:
The purpose of this study was to investigate the failure progression process of fiber-reinforced ceramic by finite element (FE) analysis. The three-dimensional FE model for three-point bending simulation was 40 mm long, 4 mm wide, 3 mm thick, and with a span length of 30 mm. Nodal force with load increment of 20 N was applied at the center of the upper surface of the beam. To evaluate matrix fracture and fiber fracture, von Mises criterion and Tsai-Hill criterion were used respectively. Consequently, the stress-deflection curve obtained from FE simulation agreed with that obtained from the experimental testing. Differences in flexural strength and modulus between the analytical and experimental results were 1.3 and -2.9% respectively — demonstrating a close agreement between both results. In conclusion, the FE model applied in the present study was shown to be valid for predicting the failure progression of fiber-reinforced ceramics.

Key words:
Finite element method, Fiber-reinforced ceramics, Failure progression analysis

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