## A Fundamental Study of the Evaluation of Toughness for Fiber Reinforced Concretes

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## 1991 Fiscal Year Final Research Report Summary

## A Fundamental Study of the Evaluation of Toughness for Fiber Reinforced Concretes

Research Project

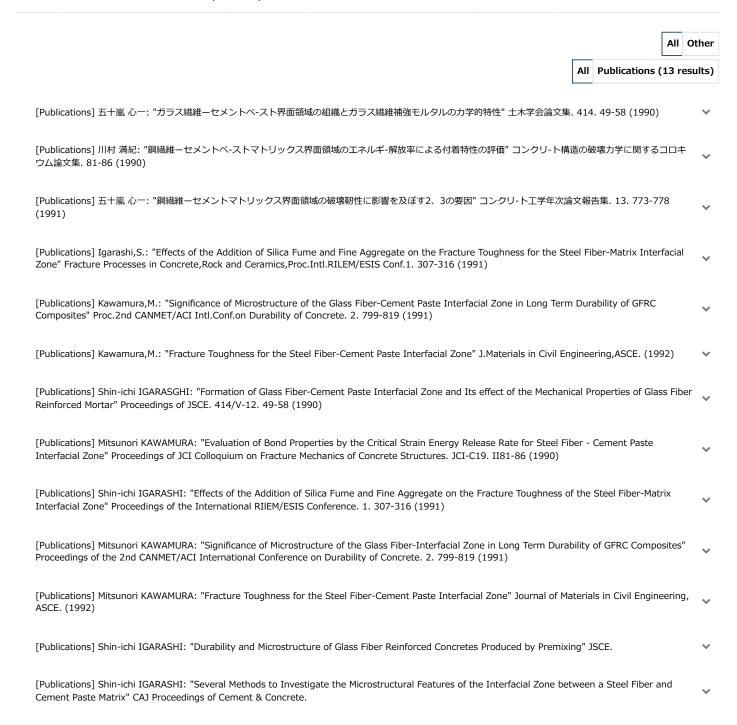
**Research Abstract** 

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Project/Area Number  02555106
Research Category
Grant-in-Aid for Developmental Scientific Research (B)
Allocation Type
Single-year Grants
Research Field
コンクリート工学・土木材料・施工
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1990 – 1991
Keywords
The Critical Strain Energy Release Rate / Interfacial Zone / Microhardness Me*asurement / Backscattered Electron Image / Fluorescent Microscopy / Debonding / Frictional Stress / Silica Fume

The significance of the bond properties between fibers and cement matrix in the toughness of fiber reinforced concretes was investigated. The bond of fiber with the matrix was characterized by the fracture toughness (i. e. the critical strain energy release rate) for the interfacial zone and the frictional shear stress along the debonded interface. Those properties were discussed relating them to the microstructure formed around fibers. The microstructure formed in the vicinity of fibers are elucidated by the microhardness measurements, BEI analysis and fluorescent microscopy. The major results obtained in this study are summarized as follows:

- (1) It was possible to evaluate experimentally the critical strain energy release rate for the interfacial zone from the single fiber pull-out test based on the compliance method.
- (2) The critical strain energy release rate for the interfacial zone between fibers and cementitious matrix appears to sensitively reflect the characteristics of the interfacial zone.
- (3) The addition of silica fume and the reduction of water/cement ratio of the matrix resulted in the dense microstructure of the interfacial zone. However, the dense interfacial zone formed by the addition of silica fume did not lead to the increase in fracture toughness for the interfacial zone.
- (4) Fracture toughness for the interfacial zone is affected by the incorporation of sand grains.
- (5) Observations for the interfacial zone under the fluorescent microscope revealed that the mode of bond failure was not a simple shear failure which has been assumed in the theoretical studies for the single fiber pull-out process.
- (6) Further work is needed to theoretically discuss the complex phenomena of debonding with the fluorescent microscope.

## Research Products (13 results)



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