Journal of Zhejiang University-SCIENCE A (Applied Physics & Engineering)

Influences of fiber length and water film thickness on fresh properties of basalt fiber-reinforced mortar

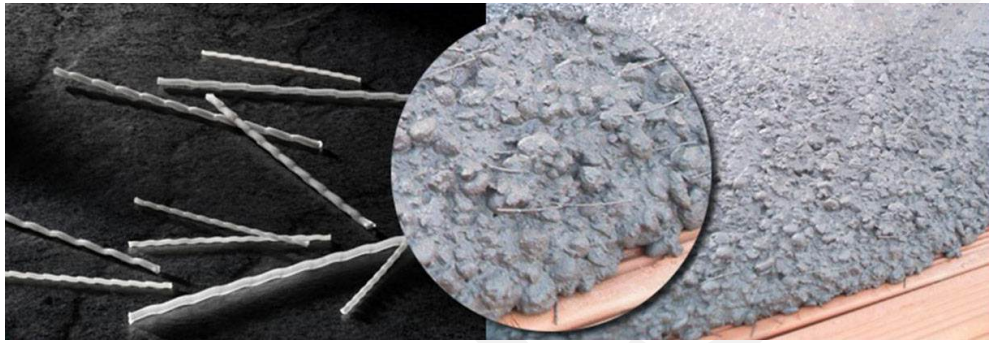
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1. Introduction

For fiber-reinforced cementitious materials (FRCM), the fiber length appears to have great effects on the mechanical performance. Besides, the fiber length also has salient effects on the fresh properties.



On the other hand, for plain cement-based materials, it was found that the water film thickness (WFT) is the key factor governing the fresh properties.

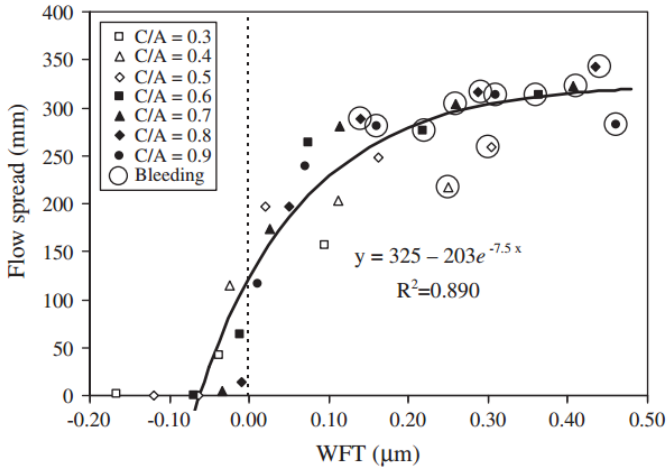
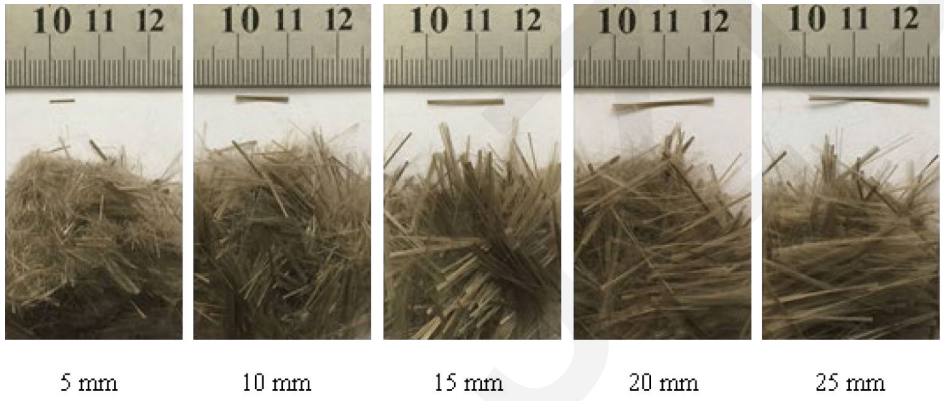


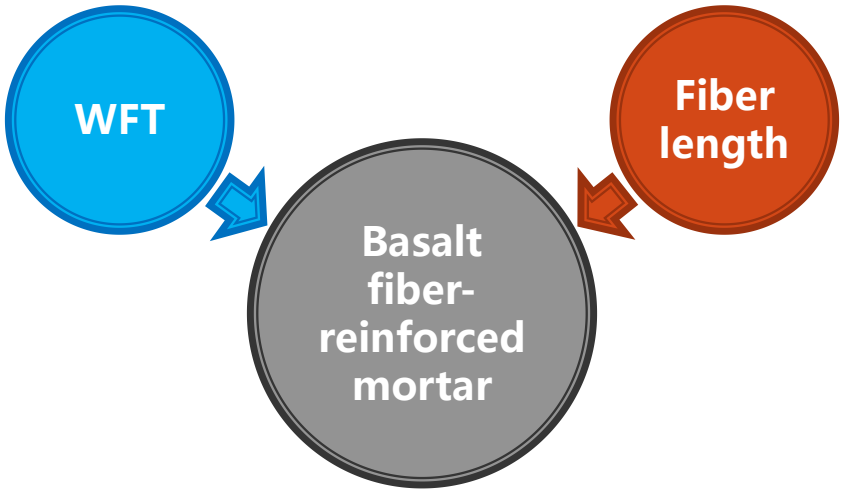
Fig. 11. Flow spread versus WFT.

1. Introduction

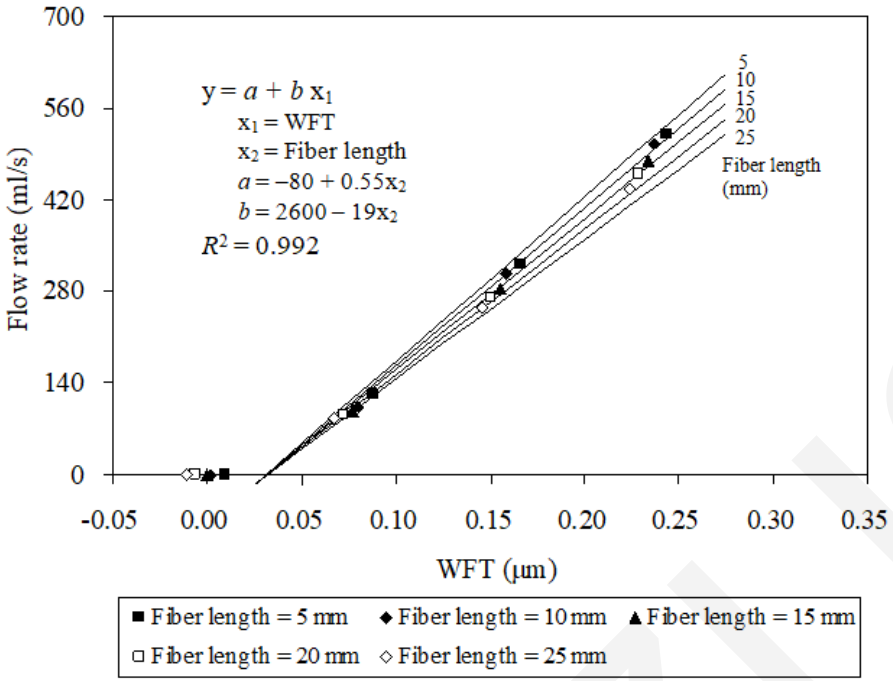
However, there is still little research on the combined effect of WFT and fiber characteristics on the fresh properties of FRCM.

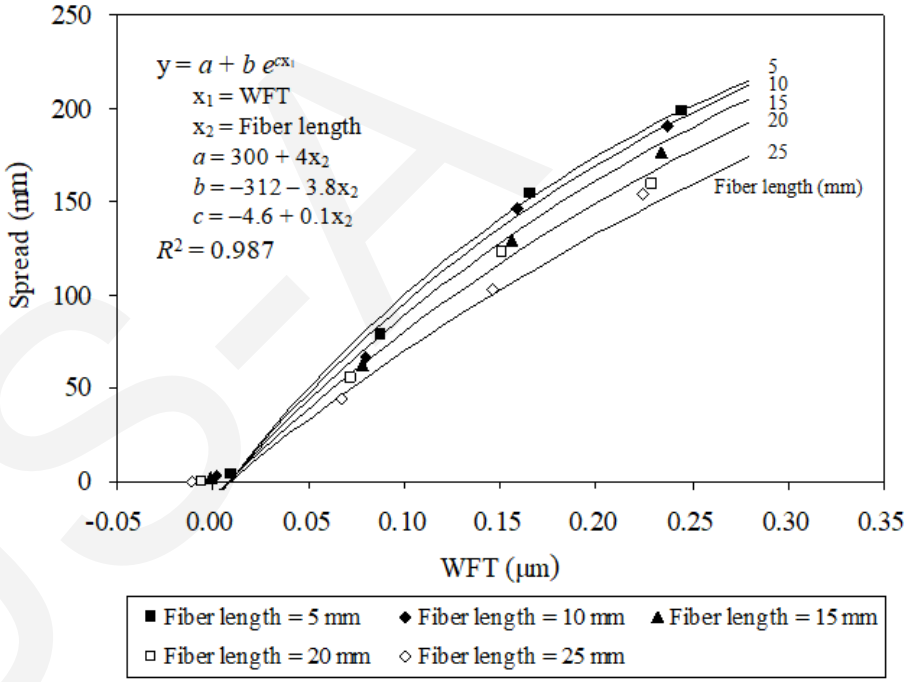
A systematic experimental research program aiming to study the influences of fiber length and WFT on the fresh properties of basalt fiber-reinforced mortar has been completed. The fiber length was varied from 5 to 25 mm and the water/cement ratio was varied from 0.25 to 0.40. Lastly, regression analysis was carried out to evaluate the roles of fiber length and WFT in the fresh properties of mortar.





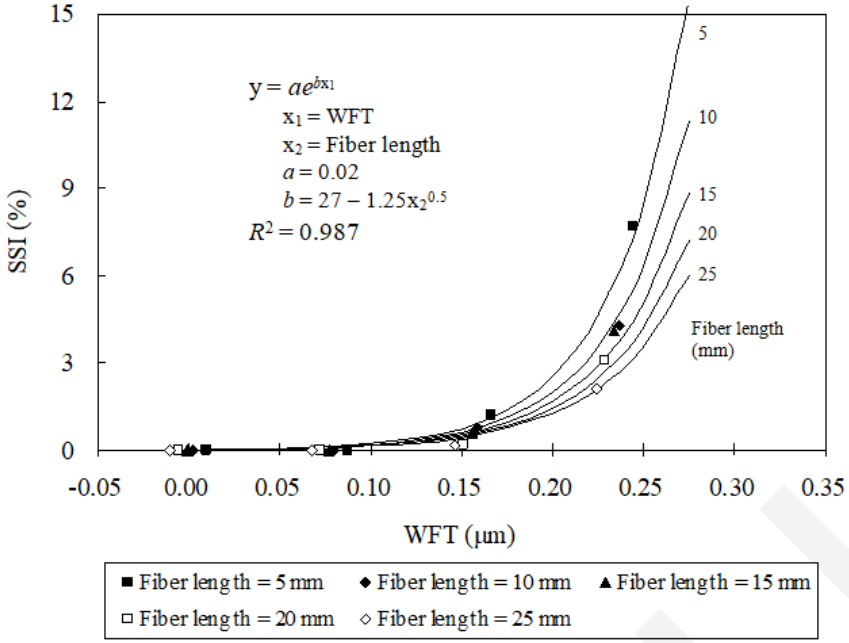
2. Test results

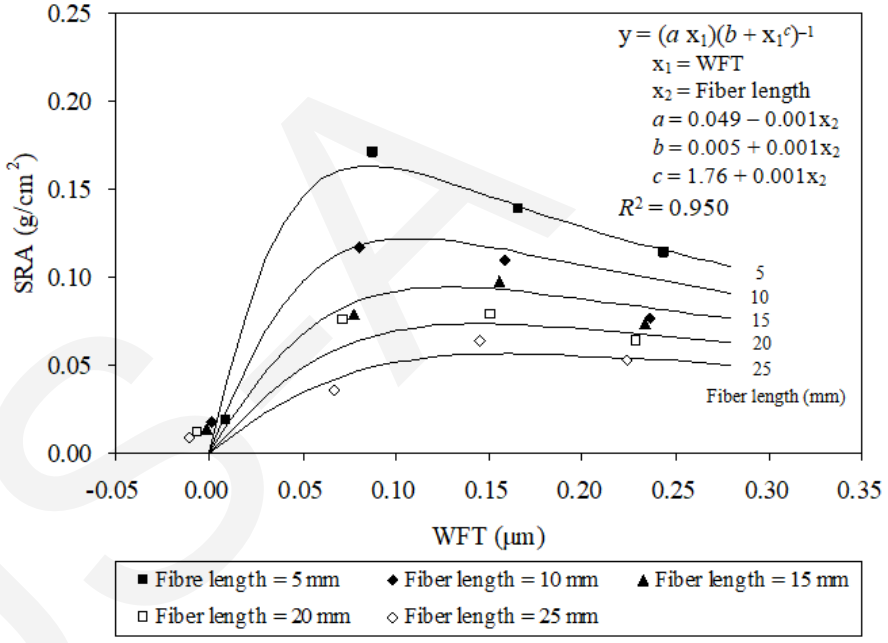




- Flow rate/spread increased with the WFT.
- At the same WFT, a mortar having a longer fiber length has a smaller flow rate/spread.
- Multi-variable regression analysis has been carried out and fairly high R^2 values has been achieved, indicating that the dynamic and static flowability is governed by both the WFT and fiber length.

2. Test results





- Sieve segregation index (SSI) increased with the WFT, while stone rod adhesion (SRA) first increased but then decreased as the WFT increased.
- At the same WFT, a mortar having a longer fiber length has a smaller SSI/SRA.
- Multi-variable regression analysis has been carried out and fairly high R^2 values has been obtained, showing that the cohesiveness and adhesiveness are governed by both the WFT and fiber length.

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3. Conclusions

- A larger WFT has beneficial effects on the dynamic and static flowability but adverse effect on the cohesiveness. However, it could have beneficial or adverse effect on the adhesiveness.
- The fiber length has adverse effects on the dynamic and static flowability, beneficial effect on the cohesiveness, and adverse effect on the adhesiveness.
- The fresh properties have been correlated by regression analysis to the fiber length and WFT, and very high R^2 values have been obtained, indicating that the WFT and fiber length are together the major factors governing the fresh properties of basalt fiber mortar.

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