

## **Mechanical and Fracture Characteristics of Multi-Size Carbon Fibers Reinforced Concrete**

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### **Abstract:**

One of the main challenges of using a high fiber volume content in concrete is the narrow fiber volume margin beyond which fibers can cause an adverse effect on the mechanical properties. To overcome this challenge, it was suggested a multi-size chopped fiber might be able to improve the fracture toughness of concrete at a relatively low fiber content. This paper reports on the effect of fiber size distribution on the fracture toughness of concrete. Different proportions of chopped carbon fibers with up to 2% fiber volume content of cement weight, and milled carbon fibers with up to 8% fiber volume content of cement weight, were used. Flowability tests showed improvement with altering the fiber size distribution despite having a high volume of fibers. Uniaxial compression cylinders, unnotched beams, and notched beams were cast then tested at 7 and 28 days of age. It was found that the compressive strength is significantly affected by fiber size distribution rather than fiber volume content. On the other hand, the modulus of rupture and fracture toughness is proportional to the fiber volume content with little effect on fiber size distribution. The different effects of fiber volume content and size distribution might be attributed to the difference in stress state under uniaxial compression compared with bending.

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