Dynamic fracture behavior analysis of FRP-strengthened concrete based on DIC and AE technology

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Abstract

In order to analyze the fracture behavior of FRP-strengthened concrete beams under dynamic loads, three-point bending dynamic tests of FRP-strengthened concrete beam specimens with four different initial crack-depth ratios (0.2, 0.3, 0.4 and 0.5) were carried out in this paper. The crack propagation was quantitatively analyzed by acoustic emission (AE) technique and digital image correlation (DIC) method, and the toughening mechanism of FRP-strengthened concrete beam during crack propagation was studied. The test results show that, there are three key points in the failure process of FRP-strengthened concrete beams with cracks, which are the crack initiation point, crack resistance point and peak load point, respectively. The load values at the three key points of FRP-strengthened concrete beams with cracks decrease with the increase of initial crack-depth ratios. The location analysis of AE shows that the number of AE events can be used to indicate the crack width in the fracture process zone (FPZ) of FRP-strengthened concrete. The crack width of concrete beam specimens can be quantitatively determined by DIC and decrease with the increase of initial crack-depth ratios, indicating that observation results of DIC and AE technology are consistent, which is effective for characterizing the dynamic fracture behavior of concrete materials.

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