

Characterization Method of ITZ in Concrete and Measurement of Nominal Compressive Elastic Modulus Based on SEM and DIC

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Abstract: With the combination of scanning electron microscope (SEM) and digital image correlation (DIC), the mechanical properties of interfacial transition zone (ITZ) in concrete are experimentally studied. The experimental compression tests are performed on cuboid samples whose half part is aggregate and the other part is mortar. The morphology of the ITZ is captured by SEM under compressive load, and from the recorded images the deformation of the ITZ is analyzed. After that, the distribution of the nominal compressive elastic modulus of the ITZ is obtained along the distance from the aggregate to the mortar, which can be used to characterize the size of the ITZ with the strain contour. A conclusion can be drawn that the area where the nominal compressive elastic modulus is obviously less than that of the aggregate and mortar can be defined as the ITZ. In this paper, the area 30~130 μm away from the aggregate can be regarded as the ITZ, where the average nominal compressive elastic modulus is about 695.1580 MPa. With increasing distance from the aggregate boundary, the nominal compressive elastic modulus of the ITZ decreases first and then increases, and at the sides close to the aggregate and mortar, the nominal compressive elastic modulus of the ITZ gradually tends to that of the two materials. Finally, the relationship between the average nominal compressive elastic modulus and the distance from the aggregate boundary can be fitted by two order polynomial function, which can be used to describe the mechanical properties of the ITZ.

Keyword: Interfacial transition zone; digital image correlation; nominal compressive elastic modulus