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拉伸应变硬化UHTCC材料的弯曲变形分析

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FLEXURAL DEFORMATION ANALYSIS ON TENSILE STRAIN HARDENING UHTCC

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摘要 该文依据弯矩-面积方法给出了弯曲变形计算的理论闭合解，结合所完成的不同厚度超高韧性水泥基复合材料试件的四点弯曲试验结果，计算了弯矩-曲率曲线、荷载-挠度曲线，通过与挠度简化计算公式及试验结果对比分析了理论公式的可行性。结果表明：基于闭合解得到的结果与试验实测值吻合最好，最大误差不超过5%，且试件厚度对变形计算基本没有影响；而基于简化公式计算的变形与实测值相差很大，最大误差达30%~50%。因此，对于有着拉伸应变硬化性能的材料，弯曲变形理论闭合解可以作为其变形计算的合理公式，并为拉伸性能反预测作准备。

关键词： 拉伸应变硬化 超高韧性水泥基复合材料 弯曲变形性能 闭合解 试件厚度

Abstract： The paper presents theoretical closed-solution to flexural deformation based on the moment-area method. The moment-curvature curve and load-deflection curve are calculated, and the feasibility of the theoretical closed-solution is further evaluated through a comparison between the results obtained by the simplified equation and the experimental measurements from four-point bending tests on specimens made of ultrahigh toughness cementitious composite. The comparison analysis shows that the results obtained based on closed-solution agree well with the test data with the maximum error of 5%, whereas the result by the simplified equation has significant errors, as high as 30%-50%. The analysis also shows that there is no influence of depth on the calculated deflection based on closed-solution. Therefore, for the tension strain hardening material, the closed solution to flexural deformation is more reasonable and can be regarded as a prediction approach for the inverse evaluation of tension property.

Key words： tension strain hardening ultrahigh toughness cementitious composite (UHTCC) flexural deformation behavior closed-solution depth of specimen

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