

一种低有机质复合材料的疲劳和断裂性能研究

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摘要: 目前应用在结构领域的有机复合材料的有机质成分大多在 15%以上。有机质含量在 15%以下的复合材料往往由于其力学性能不足而不能作为结构材料,从而极大地限制了其应用范围。本文针对一种有机质含量为 4%的压缩复合材料进行了疲劳和断裂研究。限于原材料尺寸的因素,本文采用 U 型环向缺口圆柱型试样进行疲劳测试,采用小型片状缺口试样进行断裂测试,对试样的断口进行光学和 SEM 观察,并对断口的特征参量进行测量。同时有限元方法应用在实验的预测和与标准化测试方法的比较。实验表明,该材料具有脆性特征,得到了其疲劳强度和断裂韧度,并对实验结果进行了机理解释。

关键词: 低有机质, 复合材料, 疲劳和断裂性能, 脆性特征

INVESTIGATION OF FATIGUE AND FRACTURE BEHAVIORS FOR A LEAN-ORGANIC COMPACTED HYBRID

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Abstract: Most of the organic composites used in engineering structures contain over 15 percent organic matter. Composites with organic matter less than 15 percent are less possible in application due to their poor mechanical performance. This study carried out fracture and fatigue tests on a lean-organic compacted hybrid (LOCH) with 4% organic matter. Because of limited size of the material, the fatigue tests of circular U-notched cylindrical specimens and the fracture tests of small-sized V-notched specimens were performed. Both optical and SEM observations were achieved and relevant features were examined. Meanwhile, finite element method was applied in the preexamination and the comparison with standard test methods. The result indicates fragility of the LOCH. Fatigue limit and fracture tenacity are obtained. The explanation of related mechanism was also presented.

Key words: lean-organic, composites, fracture and fatigue behaviors, fragility