碳纤维增强点阵夹芯结构的屈曲强度

Buckling of lattice truss cores sandwich structures with carbon fiber reinforced

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中文关键词： 碳纤维增强　点阵夹芯结构　屈曲强度分析　位移场假设　有限单元法

英文关键词：carbon fiber reinforced　lattice truss cores sandwich structure　buckling analysis　displacement field assumption　finite element method

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中文摘要：

　　考虑到点阵芯层的结构形式及杆单元以拉压为主的变形模式, 基于连续介质等效理论, 提出了一种全新的位移场假设, 并以此编写了计算点阵夹芯复合材料屈曲强度的有限元程序. 通过与不同试样的压缩试验的比较, 对碳纤维增强点阵夹芯结构的屈曲行为进行了分析, 并且验证了程序的有效性. 同时, 采用程序, 讨论了点阵参数(包括杆单元长度、半径及倾斜角)对点阵夹芯复合材料结构屈曲强度的影响规律. 结果表明:芯层体积分数相同的情况下, 金字塔型和四面体型点阵夹芯结构的屈曲强度相差不大, 后者略高. 所得结论对点阵夹芯复合材料结构设计具有一定的指导意义.

英文摘要：

　　Considering the geometrical configuration of the structure and the deformation mode of the lattice truss, a new displacement field assumption was proposed based on the equivalent continuum theory, and finite element method program was prepared for buckling analysis of lattice truss-core composites. By comparing with the compression test of a group of samples, the buckling behavior of sandwich structures with carbon fiber reinforced lattice truss cores was studied, and the validity was affirmed. Furthermore, the relationship between the buckling load of lattice truss-core composites and lattice parameters (including length, radius and angle of lattice truss) was discussed. The results demonstrate that the little difference exists in bulking load between pyramidal and tetrahedral lattice truss sandwich structures when the volume fraction of the cores are the same, the latter is a little higher. The conclusions are meaningful for the design of lattice truss-core composites.

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