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论文

GFRP厚板制件固化过程固化度分布

(国防科学技术大学航天与材料工程学院, 长沙 410073)

摘要：

采用真空导入模塑工艺(VIMP) 制备了85 mm 厚玻璃纤维增强环氧树脂层合板, 单面刚性模具加热固化, 沿铺层厚度方向设置热电偶, 进行了实时固化温度监测, 发现固化时厚度方向存在明显的温度差异。通过DSC方法得到等温环氧树脂固化度-时间实验数据, 建立了基于自催化反应模型的等温固化反应动力学方程, 模型计算值和实验值符合良好; 提出了时间离散分步计算法, 对非等温固化条件下, 厚度方向的固化度分布进行了计算。结果表明: 固化过程中厚度方向固化度存在差异, 短时间的后固化可以消除此差异。该方法可以模拟出由温度差异导致的固化度的不均匀分布, 用于指导优化固化工艺。

关键词： GFRP厚板 真空导入模塑工艺(VIMP) 时间离散分步计算法 固化度分布

Distribution of the cure degree for the thick GFRP laminates

(College of Aerospace and Materials Engineering, National University of Defense Technology, Changsha 410073, China)

Abstract:

The glass fiber reinforced epoxy resin polymer (GFRP) laminates with thickness of 85 mm were manufactured by the vacuum infusion molding process (VIMP), cured by one-side rigid mould heating. The temperature curves at different thickness positions during curing were examined, which shows large temperature changes in the thickness direction. The curing kinetics of the epoxy resin system was studied under isothermal curing conditions by differential scanning calorimetry (DSC) technique. The cure kinetic equations based on the autocatalytic kinetic model were established and were verified by the experimental data. A method of accumulation by time dispersing steps was set up and used to calculate the dist ribution of the degree of cure curves at different thickness positions in the curing course. The results show that there were large differences of real time degree of cure in pre-curing process, but the high equivalent degree of cure could be achieved by the post-curing process. This method could be used to calculate the asymmetrical distribution of the degree of cure in the curing course and optimize the curing stage.

Keywords: thick GFRP laminates vacuum infusion molding process (VIMP) method of accumulation by time dispersing steps dist ribution of cure degree

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通讯作者: 肖加余，博士，教授，主要从事聚合物基复合材料的研究与应用

作者简介:

作者Email: jiayuxiao@tom.com

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