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### 含涂层空心球复合泡沫塑料的黏弹性热应力分析

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### Thermal Stress Analysis for Visco-elastic Behavior of Syntactic Foams with Coating Micro-spheres

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摘要

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**摘要** 针对含涂层空心微球的复合泡沫塑料,利用三参数标准线性固体模型和黏-弹性对应原理得到了材料由于温度改变而产生的残余热应力,研究了涂层厚度、体分比和时间等因素对残余热应力的影响。结果表明:随着时间的增加,由温度改变而引起的材料内部的残余热应力将逐渐减小,且涂层厚度和涂层空心微球体分比的减小会使残余热应力增加。此外,沿半径方向热应力在微球内逐渐增加,在涂层和基体中则逐渐减小,在涂层与空心微球的交界处达到最大值。

**关键词:** 复合泡沫塑料 残余热应力 黏弹性 热膨胀系数 涂层

**Abstract:** Based on the three parameters standard linear solid model and the correspondence principle, the residual thermal stress of the syntactic plastic foams with coating micro-sphere caused by the change of temperature are determined. The effects of coating thickness, volume fraction of coating micro-sphere and time *etc.* on the residual thermal stress of material are investigated at the same time. The results show that the residual thermal stress in the material induced by the change of temperature decreases gradually with the increase of time, and the decrease of coating thickness as well as the volume fraction of coating micro-sphere can make the residual thermal stress increase. Furthermore, the thermal stress in the micro-sphere increases gradually along the direction of the radial increase, but in the coating and matrix it decreases gradually. At the interface of coating and micro-sphere, the thermal stress gets the maximum.

**Keywords:** syntactic foam residual thermal stress visco-elastic behavior thermal expansion coefficient coating

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