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## Al6061/20SiC<sub>w</sub> 板材的超塑成形极限与空洞行为

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**摘要:** 对Al 6061/20SiC<sub>w</sub> 板材在单向拉伸和等双向拉伸应力状态下的孔洞行为进行研究。利用长轴与短轴比分别为11:和1:2的胀形模具, 在恒定应力2 MPa, 温度873 K的条件下, 研究Al 6061/20SiC<sub>w</sub> 板材的成形极限。基于MARCHINI AK-KUCAYNSKI (M-K) 模型和塑性损伤模型, 提出一种用于预测Al 6061/20SiC<sub>w</sub> 板材在双向拉伸应力状态下的极限应变的分析模型。结果表明: 在相似的等效应变速率下, 等双向拉伸应力产生的孔洞数量稍多于单向拉伸应力产生的孔洞数量; 对于无初始几何缺陷的Al 6061/20SiC<sub>w</sub> 板材, 分析模型能较为准确地预测复合材料在双向拉伸条件下的极限应变。

**关键字:** 铝基复合材料; 超塑性; 孔洞; 成形性

## Forming limits and cavitation behaviors of superplastic Al6061/20SiC<sub>w</sub> sheet

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**Abstract:** The cavitation behaviors of Al6061/20SiC<sub>w</sub> sheet under uniaxial and equibiaxial tension stress states were investigated. The forming limits of Al6061/20SiC<sub>w</sub> sheet under biaxial tension using dies with aspect ratios of 1:1 and 2:1 at constant applied stress of 2 MPa and at 873 K were also investigated. An analytic model based on the MARCHINI AK-KUCAYNSKI(M-K) and plastic damage models was proposed to predict the limiting strains of Al6061/20SiC<sub>w</sub> sheet under biaxial tension stress state. The results show that at a similar effective strain rate, the amount of cavities obtained under equibiaxial tension states is slightly greater than that under uniaxial tension states. Under the condition of Al6061/20SiC<sub>w</sub>

sheet without original geometric deficiency, the prediction of the analytic mode is in agreement with the limiting strains under biaxial tension state.

**Key words:** aluminum-based composite; superplasticity; cavitation; formability

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