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轴对称件超塑约束胀形过程FEM模拟

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NUMERICAL SIMULATION FOR THE RESTRAINED SUPERPLASTIC BULGING OF AXISYMMETRICAL CIRCULAR SHEETS

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摘要 采用大变形刚粘塑性有限元（FEM)模拟了圆板轴对称超塑约束胀形的贴模过程。研究了胀形件几何尺寸（胀形高宽比 HP/RD)、材料速率敏感指数 m、摩擦因子 Am 对胀形件贴模过程 ,以及贴模方式对厚度不均的影响

关键词： 超塑性 成形技术 有限元法 模拟

Abstract： The restrained superplastic bulging of axisymmetrical circular sheets is numerically simulated by using a rigid visco plastic FEM of large deformation. During the treating of friction boundary condition for die workpiece interface,frictional stress(f) is given by f=A mk(k=/3) according to friction law of constant factor A m and frictional stiffness matrix is directed. The advantage of this method is that global stiffness matrix has symmetry. By adjusting reasonably the intial velocity guess and deceleration coefficient for iterations, the calculation unstability is avoided,which is caused due to the change of boundary condition after the metal sheet attaches the die. The influence of the ratio HP/RD (HP and RD are height and width of the die), the rate sensitivity exponent m , the friction factor A m on attaching die process is studied in detail. The effects on inhomogeneity of thickness distribution are discussed as well.

Keywords： superplasticity forming techniques finite elementmethod analogies.

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