

## 基于灰色系统理论的铝合金覆盖件成形优化模拟

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**关键词:** 铝合金 车身覆盖件 拉深筋 数值模拟 灰色系统理论 多目标优化

**摘要:** 以压边力、拉深筋高度、凸筋圆角半径、凹筋圆角半径为自变量,进行四因素四水平的正交试验,模拟铝合金覆盖件成形,获得成形工艺参数与破裂、起皱、厚度最大变薄率等质量数据的目标函数。利用灰色系统理论,分别计算得到成形工艺参数对单目标函数的关联系数和多目标函数的关联度,多目标优化将转换为单目标优化问题。进一步计算各成形工艺参数的平均关联度,获得优化的压边力、拉深筋截面几何参数,以此进行有限元模拟验证,优化的结果为变形均匀,表明成形的质量明显提高。The aluminum alloy auto panel strength beam was numerical simulated by FEM software while press force, the depth, die radius, punch radius of draw bead were independent variables, the data about the crack, wrinkle and the thinning were acquired by an orthogonal experiment. Then the grey relational generating between forming process and the single objective function, the grey rational grade of multi-objective were calculated by the grey theory system, thus the multi-objective design was changed into the single-objective design. Furthermore the average grey relational grade of the forming process was analyzed. Employing the optimization data, the auto panel forming was numerically simulated. The conclusion demonstrated that the sheet forming quality is obviously increased by the optimized forming process parameters.

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