

Establishment and Application of Numerical Simulation Model for Shot Peen Forming Stress Field Method

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Abstract : Shot peen forming is an essential forming process for aircraft metal wing panel. With the development of computer simulation technology, scholars have proposed a numerical simulation method of shot peen forming based on stress field. Three shot peen forming indexes of crater diameter, shot speed and surface coverage are required as simulation parameters in the stress field method. It is necessary to establish the relationship between simulation and experimental process parameters in order to simulate the deformation under different shot peen forming parameters. The shot peen forming tests of the 2024-T351 aluminum alloy workpieces were carried out using uniform test design method, and three factors of air pressure, feed rate and shot flow were selected. The second-order response surface model between simulation parameters and uniform test factors was established by stepwise regression method using MATLAB software according to the results. The response surface model was combined with the stress field method to simulate the shot peen forming deformation of the workpiece. Compared with the experimental results, the simulated values were smaller than the corresponding test values, the maximum and average errors were 14.8% and 9%, respectively.

Keywords : shot peen forming, process parameter, response surface model, numerical simulation

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