Heat source modeling of keyhole Laser Welding process: Models analysis

A. MASMOUDI, M. AISSANI, M. BOUKRAA, A. ZITOUNI, T. REDDAH

Abstract: Laser welding is widely used in several industrial applications for the development of different structures such as in aeronautic, nuclear field…etc. It is characterized by high weld speed, low energy entering into the assembled metals and small affected zone, indeed particular accuracy. Heat transfer is one of the complex phenomena occurring during laser welding operation, which aims for the material properties at higher temperatures. This paper focuses on analysis of laser beam heat source models of deep penetration laser welding (keyhole). The various models describing this heat source of power distribution developed, using heat flux, are presented. In literature, most of works focus the attention on the models of the laser-material interaction, so that allows to obtain the temperature distribution during the laser welding. Finally, the main methods used in modelling and numerical simulation of laser welding are discussed and illustrated with some case studies, showing the most efficient model.

Keywords: Laser welding, keyhole, modeling, heat source, laser-material interaction