

Monitoring Nugget Size of Small Scale Resistance Spot Welding

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Small scale resistance spot welding (SSRSW) process is used in biomedical and electronic devices fabrication. Controls that monitor the quality of the joining process or for a further step ensure a consistent joining quality is not available. To successfully implement a control, it is important to find a reliable way to identify the quality of joining first. Welding current, voltage, electrode displacement, and force change during a spot welding process are monitored to judge the quality of joining process. A high speed video camera was used to precisely measure the displacement of the electrode during welding. After imaging processing, a displacement curve is available. The curve presents two different moving speeds of the electrodes during cooling of workpiece; one is high, which is believed to related to the solidification of nugget, while the other is lower, which is believed to be connected with the thermal contraction of the material between electrodes. The high speed displacement is found to be correlated to nugget thickness more precisely than the total displacement of the electrodes. The voltage, displacement, and force change clearly indicate the occurrence of expulsions. The magnitude of the changes of the signals is a quantitative indicator of the extent of expulsion, which is expressed by the depth of the indentation on the surface of workpiece.