

2016

Experimental study of metal transfer of CMT welding

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Abstract : The CMT welding process was investigated in this work. The transfer of Al-4043 filler metal during welding was visualized using a high-speed camera with a green laser as an illumination source. Three phases was identified during the transfer cycle. A hot phase during which a molten droplet is formed on the end of the wire electrode under a high current. A cold phase corresponds to the move of the wire toward the weld pool. The contact between the droplet and the weld pool create a short circuit during which the material transfer is initiated and the arcing current reduced. After a set time (in the middle of the short circuit phase), the wire is retracted mechanically to contribute to the droplet detachment without increasing in current welding. The effect of the current waveform on the metal transfer is investigated too. The reduction in the hot phase duration of the current waveform decreases the volume of liquid droplets at the wire tip and allows to increase the short-circuit frequency.

Keywords : CMT welding; waveform; current; transfer; phase; droplet