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Formation of weld crater in GMAW of aluminum alloys. (English) Zbl 1179.80022
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Summary: Both mathematical modeling and experiments have been conducted on the formation of the crater formed in a gas metal arc welding (GMAW) of aluminum alloy 6005-T4. Transient weld pool shape and the distributions of temperature and velocity were calculated by a three-dimensional numerical model. The final weld bead shape and dimensions were obtained. Corresponding experiments were conducted and in good agreement with modeling predictions. Metallurgical characterizations were also performed on the experimental samples. It was found that due to the fast solidification of the weld pool after the termination of the welding arc, there is no time for the molten metal to flow back towards the weld pool center and close up the crater. Thus a crater was formed at the end of the weld bead. Solidification cracking was formed at the center of weld crater. A “back-up” technique was proposed to allow extra molten metal to flow back to the crater and fill it up. The crater was successfully filled and the crater cracking was eliminated.

MSC:

- 80A20 Heat and mass transfer, heat flow (MSC2010)
- 76T99 Multiphase and multicomponent flows
- 76-05 Experimental work for problems pertaining to fluid mechanics
- 80-05 Experimental work for problems pertaining to classical thermodynamics
- 76M25 Other numerical methods (fluid mechanics) (MSC2010)

Keywords:

gas metal arc welding (GMAW); aluminum welding; crater; microstructure

Full Text: [DOI](#)

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