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**Weld pool dynamics and the formation of ripples in 3D gas metal arc welding.** (English)

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Summary: This article studies the transient weld pool dynamics under the periodical impingement of filler droplets that carry mass, momentum, thermal energy, and species in a moving 3D gas metal arc welding. The complicated transport phenomena in the weld pool are caused by the combined effect of droplet impingement, gravity, electromagnetic force, plasma arc force, and surface tension force (Marangoni effect). The weld pool shape and the distributions of temperature, velocity, and species in the weld pool are calculated as a function of time. The phenomena of “open and close-up” for a crater in the weld pool and the corresponding weld pool dynamics are analyzed. The commonly observed ripples at the surface of a solidified weld bead are, for the first time, predicted by the present model. Detailed mechanisms leading to the formation of ripples are discussed.

**MSC:**

- 80A20 Heat and mass transfer, heat flow (MSC2010)
- 76D05 Navier-Stokes equations for incompressible viscous fluids
- 78A30 Electro- and magnetostatics
- 80A22 Stefan problems, phase changes, etc.
- 76R10 Free convection
- 76M20 Finite difference methods applied to problems in fluid mechanics

Cited in 6 Documents

**Keywords:**

GMAW; ripples; weld pool dynamics

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