Effect of welding mode on selected properties of additively manufactured AA5087 aluminium alloy parts

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Wire and arc additive manufacturing (WAAM) is a popular direct energy deposition (DED) method for production of large-scale metallic components [1-3]. The main advantages of the technique are high deposition rate and low cost [4]. Furthermore, utilization of the WAAM is very popular in aerospace industry [5,6]. The AA5087 aluminium alloy with 4.5 wt.% of magnesium has been investigated because of its very good mechanical properties [7]. The present research deals with the study of thermal cycles and fields developed in the alloy during additive manufacturing with three different Cold metal transfer (CMT) modes, namely conventional (CMT), pulse (CMT-P) and cycle-step (CMT-CS). The welding system was equipped with a Fronius TransPulse Synergic 3200 CMT power source, a Fanuc Arc Mate 1000iC 6-axes robot with a R 30iA control unit, welding torch and 1-axis positioner. The AA5087 aluminium alloy welding wire with diameter of 1.2 mm was deposited onto AA5083 aluminium alloy plate with dimensions of 70 mm x 200 mm x 3 mm during the experiment. The thermal cycles were documented using Ahlborn Almemo 5690-2 measuring station equipped with K type thermocouples. The thermal fields were monitored with FLIR E95 thermography camera. The results showed the evident influence of arc mode on the temperatures developed in manufactured aluminium alloy parts during the process of WAAM.

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