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Experimental study of the weld pool temperature of thin plates of UNS S32304 duplex stainless steel by GTAW process

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The aim of the experimental arrangement is the measurement of the weld pool temperature during the application of the conventional arc GTA-welding on autogenous thin plates of UNS S32304 duplex stainless steel. Grade UNS S32304 was developed for the most severe applications including off-shore. The stationary arc welding was applied with a DC current for two minutes using pure argon as shielding gas in center of the duplex stainless steel disc. For the temperature into the weld pool were used a S-type (Pt-Rh) and K-type (Ni-Cr) thermocouples connected close to weld pool. The temperatures were measured in top and bottom sides of the plates. It was observed an overheating temperature into the weld pool on the top side and as expected the fusion point was verified in corresponding at the bottom side. The microstructure was characterized and an increase of ferrite phase in solidified zone and heat affected zone was observed. The hardness mapping provided information about mechanical properties behaviour. A numerical analysis of temperature distributions were used to simulate welding cycles associated to microstructure evolution.