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Underwater local dry cavity laser welding of 304 stainless steel

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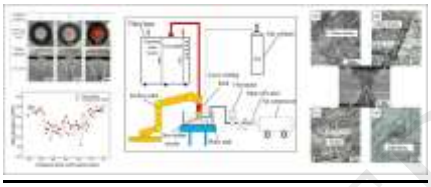
GRAPHICAL ABSTRACT



Abstract: The relationship between the gas rates and the shielding condition of the double-layer gas curtain nozzle utilized in underwater laser beam welding (ULBW) was observed. The welding morphology, weld porosity and mechanical properties of butt joints produced in different process parameters were investigated. With the increase of the heat input, the welding porosity decreased firstly and then increased. Higher welding porosity degraded the mechanical properties significantly and the formation of the welding pores could be attributed to the water vapor generating on the bottom surface of the joint and the solidification rate of the molten pool. The high-quality butt joint of ULBW without welding pores was obtained under optimal process parameters, whose tensile