Comparison of microstructures and mechanical properties of Al-Ti weld joints prepared by different welding technologies

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The difficulties in joining aluminum to titanium alloys by fusion welding technologies result not only from significant differences in the physical, mechanical and thermal properties of the two materials but mainly from the unavoidable formation of brittle intermetallic compounds [1-4]. Various conventional and unconventional welding technologies were tested to obtain sound weld joints of these materials, and the influence of welding parameters on the quality of produced weld joints was evaluated [5-6].

In this study, the butt welded-brazed joints of two plates with the thickness of 2 mm of EN AW5083-H111 alloy and titanium Grade 2 were prepared applying two different welding technologies: laser beam welding (LBW) and gas tungsten arc welding (GTAW). ER4047 and ER4043 welding wires with the diameter of 1.2 mm were used as filler materials. The microstructure and mechanical properties of experimental weld joints were analyzed and compared. In general, the strength of welded-brazed joints prepared by laser welding was higher than the strength of samples after GTAW. The highest tensile strength at the level of 245 MPa was measured for the welded-brazed joint manufactured by LBW using following welding parameters: the laser power of 1800 W, the welding speed of 30 mm.s^{-1}, the laser beam offset to Al-sheet of 400 μm and the wire feed speed of 2.4 m.min^{-1}.

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