**An innovative process applied to the joining of steel to aluminum in a lap-joint configuration.**

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A process based on Friction Stir Welding has been developed to weld dissimilar metals presenting different melting temperatures, particularly steel and aluminum, in a lap-joint configuration. For this process, the rotating tool is pressed and translated over the surface of the "high-melting point" material in order to generate enough frictional heat so that the melting temperature of the "low-melting point" material is locally reached. Welding then occurs thanks to adequate local reaction between the liquid and solid phases. The key parameters were identified leading to the conclusion that both bi-layered (steel-Al) and tri-layered (steel-Al-steel) joints can be welded depending on the advancing speed of the tool. Microscopic examinations were systematically performed to highlight the link between the process parameters and the microstructure of the steel-Al interface. Eventually, the influence of the process parameters and of the intermetallic layer on the mechanical properties of the joints was investigated.

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