Effect of laser wobbling on AA6022 Al alloy to AZ31 Mg alloy dissimilar welding with Ni interlayer

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This study investigates the effect of laser wobbling during dissimilar laser welding of aluminum and magnesium with nickel foil interlayer. Sheets of 2 mm thick AA6022 and AZ31 alloy were joined with a 0.1 mm thick Ni foil sandwiched between to facilitate joining. The welding process was conducted with conventional and wobbling method using various laser speeds (mms^{-1}) and power (W). Microstructural characterization was conducted using optical microscope, scanning electron microscopy (SEM) and energy dispersive spectroscopy (EDS). The hardness values of the joints were measured using Vickers hardness test. The micrographs reveal that conventional laser samples fractured prematurely during the cutting process due to the presence of Al-rich brittle interface. However, most of the wobble laser samples remained intact due to the presence of a Mg-rich interface which provided some ductility. Hardness tests show that the Mg-rich interface has a hardness comparable to the base metal, but the Al-rich interface exhibits a significantly higher hardness, indicating brittle phase. EDS analysis reveals preferential interaction between Al and Ni to form Al_xNi_y compounds. It can be concluded that the laser wobbling technique enhances the joint strength by substituting the joint interface with a Mg-rich ductile phase and limiting Al to Mg interaction.