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Characterization of Welds in Copper Generated by a High-Power Blue Laser

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High quality precision welding of copper has become increasingly important following the trends of electrification of automobiles and automation of manufacturing. Laser welding is a suitable technique to achieve precision copper welds, whether between copper or between copper and other materials. However, high quality welds can be difficult to attain because of copper's high reflectivity to infrared lasers and high thermal conductivity. This study characterizes conduction welds from line and spot welds created using a state-of-the-art 1.5 kW, 355 nm blue CW diode laser on 0.9 mm thick copper with 0.3 mm thick stainless steel. The results of the study showed that weld penetration depth, weld width, porosity and grain size are positively correlated with laser energy input. The presence of weld zones show that the use of relatively low-powered blue lasers can overcome the initial reflectivity of copper to infrared lasers but the observation of porosity in all welds means that process parameter optimization remains important to achieve high quality welds.