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**Microstructure and mechanical properties of 7075-Al alloy joint ultrasonically soldered
with Ni-foam/Sn composite solder**

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Abstract

Ultrasound-assisted soldering of 7075 Al alloy was performed using Ni-foam reinforced Sn composite solder. The phase composition, interfacial microstructure and mechanical properties of Al/Ni-Sn/Al joints soldered for different times were investigated. Results showed that, the bonding ratio of joint was increased with increasing ultrasonic soldering time and was stabled at approximately 98 % when the soldering time was longer than 20 s. The Ni-foam in joint was compressed into a strip type and a Ni_3Sn_4 intermetallic compound (IMC) layer was formed on the Ni skeleton surface, whilst an Al_3Ni IMC layer was formed on the Al substrate surface. The Al_3Ni phase was dot-distributed in joint soldered for 5 s then formed continuously in joint soldered for 15 s. However, further increasing the soldering time to 30 s resulted in the drastic growth of Al_3Ni IMC layer, accompanied with the depletion of Ni_3Sn_4 phase. The formation and microstructure evolution mechanisms of the Al_3Ni IMC layer was discussed. The measured shear strength of joint was first increased then

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