Soldering to Aluminium Foil

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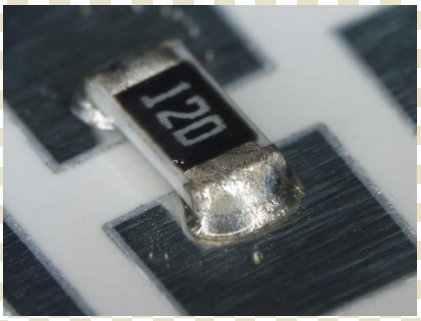

[1. Introduction]

Aluminium is generally known to be a material that is unsuitable for soldering because the oxide film formed on the surface is rigid and is not easy reduced.

Conversely, the specific gravity of Aluminium is light, and its base metal price is lower compared to copper (when compared to the same volume, the base metal price of Aluminium is approximately 1/9th that of copper). Therefore, the possibility of soldering to Aluminium is being pursued.

[2. Sn Addition to Aluminium Foil]

Low melting-point metals such as Bi, Pb, and Sn do not form intermetallic compounds with Aluminium and their solid solubility in Aluminium is extremely low. Furthermore, it is known that when Aluminium foil to which these elements have been added is heat-treated, such elements segregate on the Aluminium foil surface. Accordingly, the behavior and soldering properties of Sn were investigated by adding Sn, which is the main component of solder, to Aluminium.

[3. Behavior of Sn in Aluminium]

Sn was added to Aluminium at 3%, and a cast slab was rolled to a thickness of 30 μm, then the slab was heat-treated.

Fig. 1 depicts observation results of cross sections of Aluminium foil thus obtained. Before the Anneal was implemented, Sn was distributed in a layered manner in the Aluminium foil. However, when the Aluminium crystals changed because of the Anneal, Sn segregated into the crystal grain boundaries, and in due course much of that eventually segregated on the Aluminium foil surface.

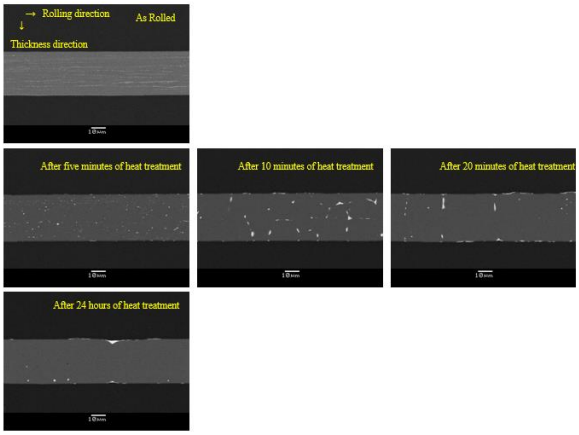

Fig. 1 State of Sn segregation before and after Anneal

[4. Evaluation of Soldering]

0.05 g of solder paste was placed on the surface of the Sn-added Aluminium foil to test reflow soldering. As shown in Fig. 2, the result was to confirm that the solder wetted and spread out on the Sn-added Aluminium foil in the same way as on the copper foil. It should be noted that the flux of solder paste used is of ROM1 grade (halogen content less than 2%).

Furthermore, Fig. 3 shows the results of observing the cross-section of the solder joint. Intermetallic compound layers were formed between the solder and the Aluminium foil. It was confirmed that the thickness

of the intermetallic compound layer (1) was approximately 0.3 to 0.5 µm, and that of the intermetallic compound layer (2) was approximately 0.2 to 0.3 µm.

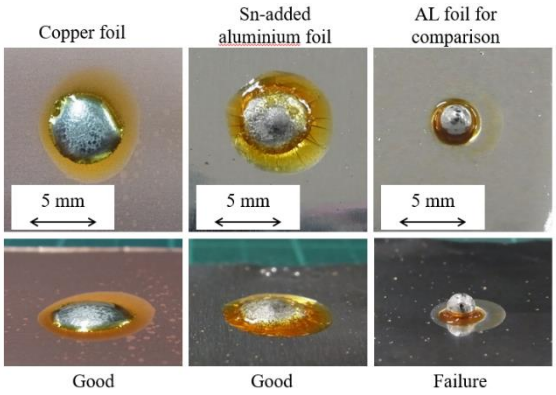

Fig. 2 Status of solder after reflow

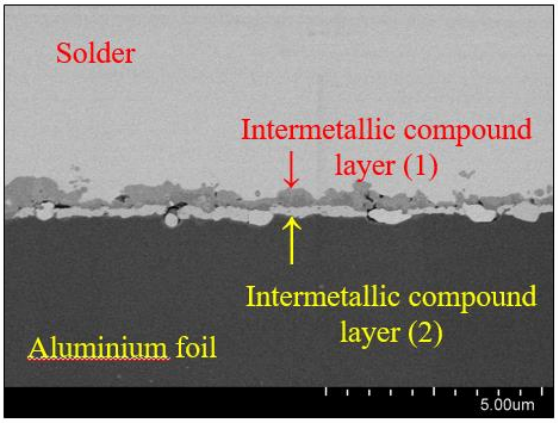

Fig. 3 Cross-section of solder joint

[5. Summary]

It was confirmed that soldering was easier on the Aluminium foil to which Sn was added, compared to ordinary Aluminium foil. It was also confirmed that intermetallic compound layers were formed at the solder joint.