

## 接触角計測システムを用いたはんだぬれ性評価技術の開発

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Development of Wettability Evaluation Technique Using Contact Angle Measuring Equipment in Soldering

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概要 溶融はんだの接触角を in-situ で光学的に計測するために開発した技術を既存のぬれ性試験機(メニスコグラフ試験機)に組み込むことで、物性値(接触角, 界面張力)による定量的なぬれ性評価・解析が可能なシステムを構築した。代表的な鉛フリーはんだである Sn-3.5Ag のぬれ性評価に適用した結果, Sn-3.5Ag と Cu とのぬれ接触角( )は 43deg と大きく Sn-37Pb( =23deg)に比べてぬれ性に劣ることがわかった。さらに、ぬれ性に及ぼす Sn-3.5Ag への元素添加 (1%Cu, 1%Zn, 5%Bi, 5%In), フラックスおよび Cu 表面の Au コーティング処理の影響について検討し、接触角の差異には、はんだ、基板、フラックス間の界面張力の違いが起因することを明らかにした。

## Abstract

We have combined the conventional wettability tester (meniscograph tester) with the newly developed contact angle measuring equipment, which optically and in-situ measures the contact angle of molten solder. Using this new evaluation system, the wettability can be quantitatively evaluated and analyzed on the basis of physical parameters (contact angle and interfacial tension). In the wettability evaluation of Sn-3.5Ag, which is the typical Pb-free solder, it was found that its contact angle ( ) is greater than that of Sn-37Pb and its wettability is significantly inferior. Moreover, this new system was applied to the detailed investigation of the influence of various factors such as alloying elements (1% Cu, 1% Zn, 5% Bi, 5% In), flux and Au coating on the Cu substrate on the wettability of the Sn-3.5Ag. It was clarified that the changes in its wettability are caused by the difference in the three interfacial tensions between the solder/flux, substrate/flux and substrate/solder, which are affected by the solder composition, flux, substrate surface and intermetallic compound formed at the solder/substrate interface.

**Key Words:** Solder, Contact Angle, Interfacial Tension, Wettability, Meniscograph Method