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Zn-25Sn系高溫無鉛焊錫的研究

Investigation of Zn-25Sn based high temperature lead free solder

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研究重點：

Lead use is harmful to environment and human beings. There are most urgent demands for developing the high temperature lead free solders. Zn-25Sn is a promising lead free candidate for substituting high lead content solders. However, the main drawbacks are its poor oxidation resistance and poor wettability. In order to find out the dewetting mechanism in wetting and improve the wettability and oxidation resistance of this alloy, Ar and air atmosphere were compared， Pr and Al element additions were selected for investigations.

研究成果：

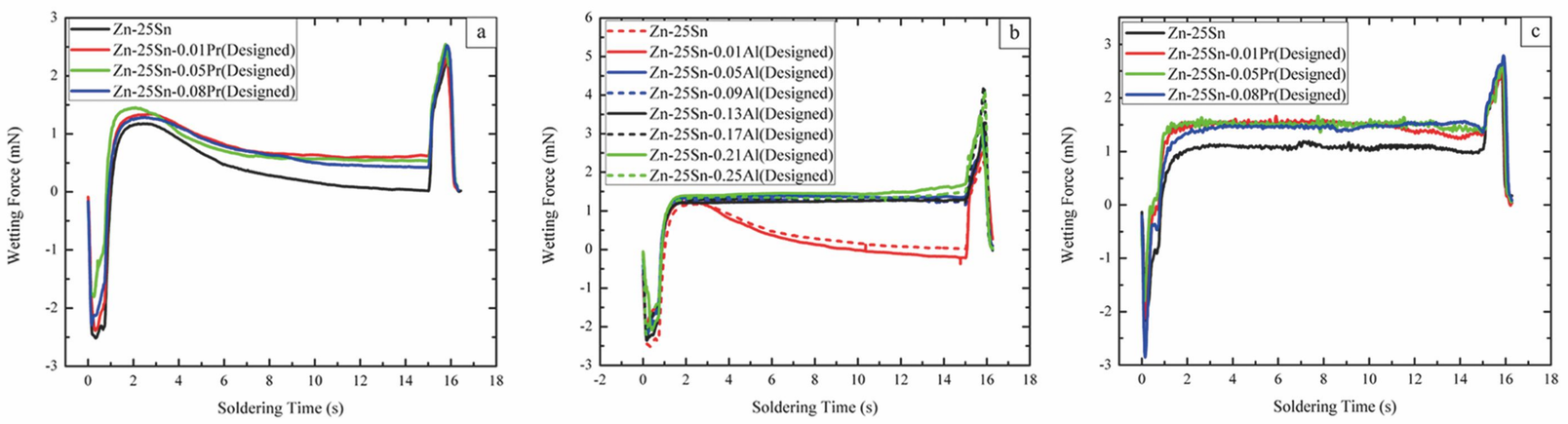

Fig.1 Wetting curves of different solders: (a) Zn-25Sn and Zn-25Sn-XPr (X=0.01,0.05, 0.08wt%)(Designed) in air atmosphere. (b) Zn-25Sn-YAl (Y=0.01-0.25wt%) (Designed)in air atmosphere. (c) Zn-25Sn and Zn-25Sn-XPr (X=0.01, 0.05, 0.08wt%) (Designed) in Ar atmosphere.

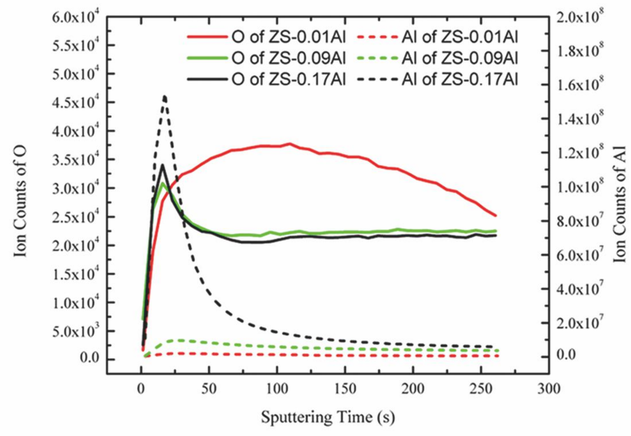

Fig.2. The depth profile analysis of element O and Al of Zn-25Sn-YAl (Y=0.01, 0.09, 0.17wt%) (Designed) by Secondary Ion Mass Spectroscopy

（1）Dewetting occurs in 2-3sec from the beginning of the wetting experiment in air atmosphere for the solders containing 0.01wt%Al, and the Zn-25Sn, Zn-25Sn-XPr solders. However, the dewetting does not occur to the higher Al content solders in air, and the Zn-25Sn and Pr-containing solders in Ar atmosphere either. Ar protection and Al addition can impede the dewetting of Zn-25 and Zn-25Sn-XPr solders.

（2）The addition of 0.01wt%Pr, enhances the wetting force of the Zn-25Sn solder both in air and Ar atmosphere. The ˙γ SL of solder/Cu was decreased with Pr additions as deduced from the wetting curves and the Young's equation.

（3）The oxygen dissolves in the Zn-25Sn-0.01Al is insufficient for forming oxide at the surface as seen for Zn-25Sn-0.09Al and Zn-25Sn-0.17Al. The high concentration of oxygen in the top solder layer results in dewetting behavior.

研究生活及心得：

從事電子構裝材料研究的日子充實而忙碌，汲取知識的過程是快樂的，是人生寶貴的財富。科技創造未來，創新引領成長。隨著永續發展理念的貫徹，綠色科技日益成為人們關注的焦點。很幸運能夠成為此領域從事科學研究的一員，也希望今後在焊錫領域最終實現無鉛化的進程中做出積極的貢獻。