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GRAPHITE AS AN INTERMETALLIC COMPOUND (IMC) SUBSTITUTION FOR A ROBUST SOLDER JOINT.

PRODUCT DESCRIPTION

Conventionally, Sn-Pb types of solder were highly used in the electronic packaging industries as it excels in most of its properties. But, then it was realized that lead (Pb) were hazardous to the environment and human health, so it was banned and restricted from usage by many countries of the world. With this, various researches were done in an effort to develop alternative solder. Several types of lead-free solder have been introduced with most common lead-free solders used nowadays are Sn-Ag-Cu and Sn-Cu. By introducing reinforcement to the solder matrix it is proven that the properties of the solder can further be enhanced.

Sn-Cu solder alloy were incorporated with graphite which acts as a reinforcement and the solder composites were produced by using Powder Metallurgy (PM) method which consists of mixing, compacting and sintering. This technique is economical as it produced low scrap with low energy consumption and it needs no skilled worker to operate the machines.

PROBLEM STATEMENT

Currently, there are several types of lead-free solder used in industry and one of them is Sn-0.7Cu. The solder melts at 227°C. The downside of this solder is that its mechanical properties is lower than other commonly used lead-free solder such as Sn-Ag-Cu or Sn-Ag types of solder. By incorporating Graphite, which will act as reinforcement, the mechanical properties of the solder can be improved vastly.

PROPERTIES OF Sn-Cu-Graphite Lead-Free Composite Solder

Properties	Sn-Cu	Sn-Cu-Graphite
Melting Point (°C)	228.78	228.48
Contact Angle (°)	23.49	16.76
Hardness (Hv)	10.9	12.3
CTE Values (E-6/K)	17.1	16.6
IMC Thickness (µm)	2.79	2.03

NOVELTY / INVENTION

- Excellent solderability.
- Excellent mechanical properties.
- Excellent wettability.

PRODUCT ADVANTAGES

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PRODUCT ADVANTAGES

- Non-hazardous material content.
- Recommended in replacing the existing commercial Sn-Cu lead-free solder.
- Improvement for high joint reliability in current and future emerging technology.

INDUSTRIAL COLLABORATION



ACKNOWLEDGEMENTS

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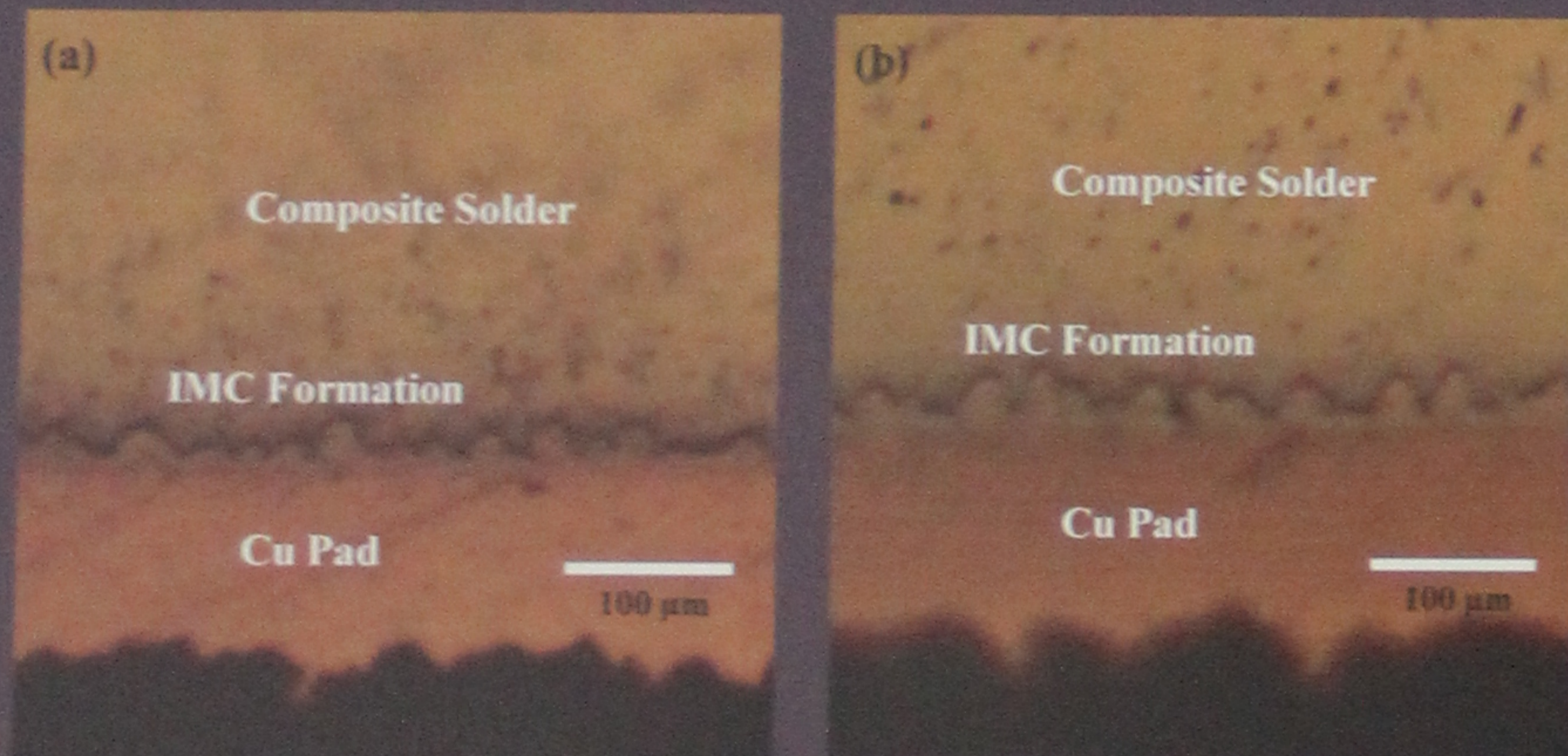


Fig 1: IMC formations of Sn-Cu solder (a) without Graphite as reinforcement and (b) with Graphite as reinforcement.

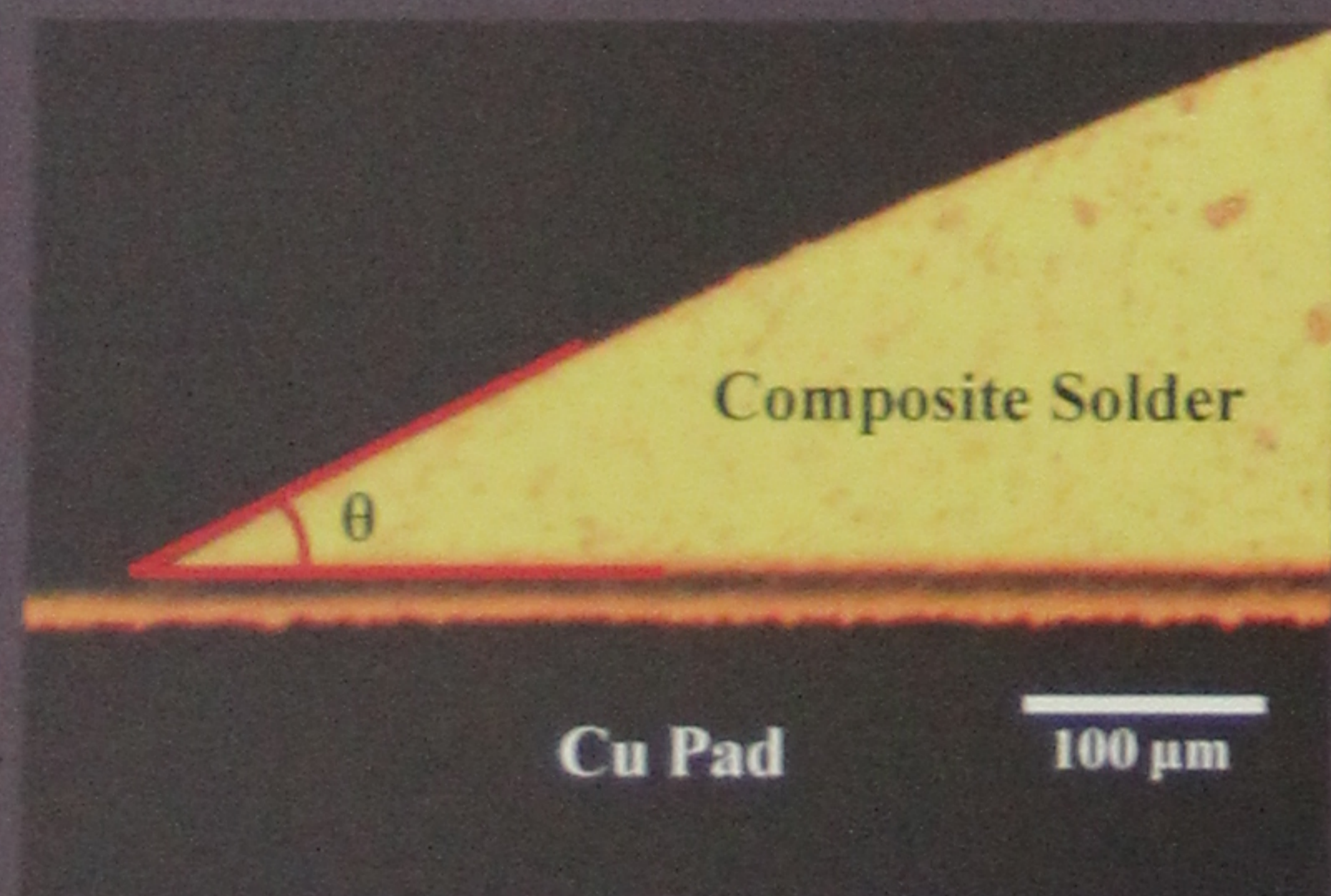


Fig 2: Sn-Cu-Graphite post reflow with good wettability angle.