

# ULTIMATE: Soldering Aluminium at Low Temperature

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## Challenges and objectives

*To design, alloy and process low melting leadfree solder compositions for the purpose of reducing stresses in solder joints to be used in a bio ambient or temperature sensitive environment.*

## Technical goals

In future developments IC technology will be combined with biological objects. For biological components the temperature range for proper functioning is limited. It is therefore necessary to develop an electronic interconnect technology that has little impact on the temperature budget of the biocomponent.

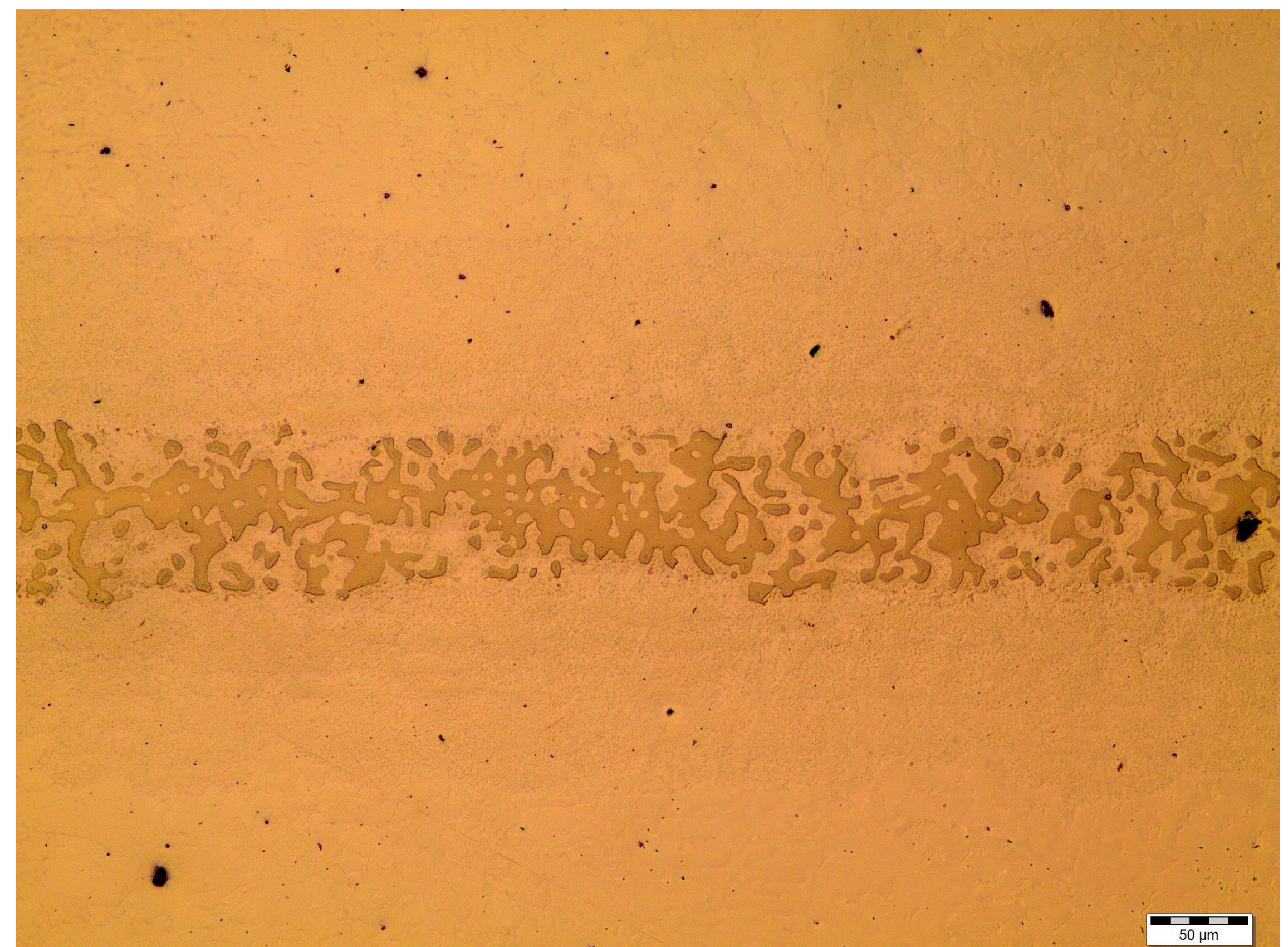
The present standard low temperature eutectic solders are BiSn and InSn with melting points of 139 °C and 119 °C respectively. Next to that BiIn based intermetallic alloys are interesting due to the ordered structure in the solid state and therefore they have good mechanical properties close to the melting point. Preliminary trials have shown that it may be possible that leadfree low melting alloys can be reflowed in fluxless manner in a suitable vapor phase soldering process. This process allows for high energy transfer rate and absolute temperature control. This opens up a manifold of possibilities for the assembly of temperature sensitive components.

This project will therefore focus on the development of:

- Lead-free solder paste melting at a low, biocompatible temperature and transforming through an internal reaction into a material with a higher liquidus.
- Reflow soldering of low-melting solders such as InBiSnAg alloys, with different additives, for controlling the microstructure by means of low temperature vapor-phase soldering.

## Expected impact

- This is a new application field. It will become possible to make solder joints below 100 °C and most probably even lower.
- Solder paste formulations will be developed that, after reflow, will have a higher liquidus than before.
- Soldering alloys will be designed and realized for the purpose of reducing stresses in solder joints used for temperature sensitive components that will exhibit good properties with regard to strength and ductility.
- The low processing temperature will lead to stress-free interconnects.
- It is therefore expected that it will lead to patents and publications and definitely will have a positive impact on sales and employment.



*Secondary Electron Microscopy image of a low temp solder joint. The surface finish of both the substrate and component are pure Tin and the solder is a dedicated InBiSn alloy.*