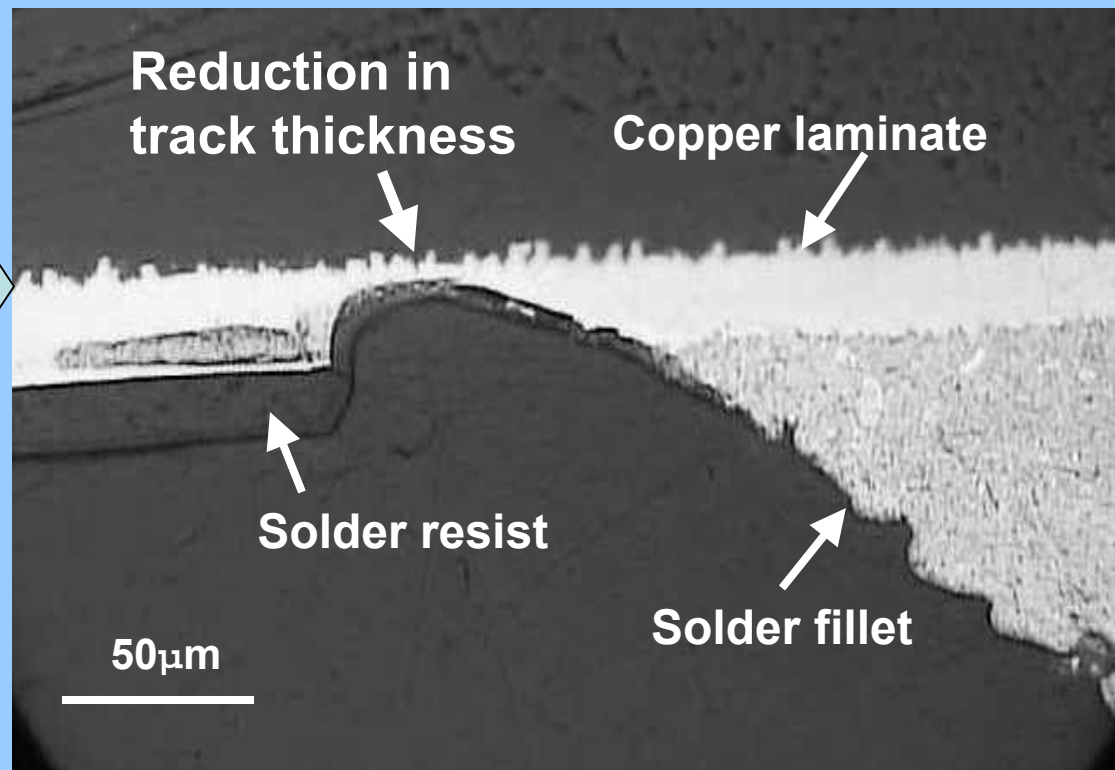
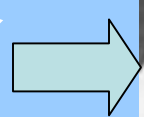
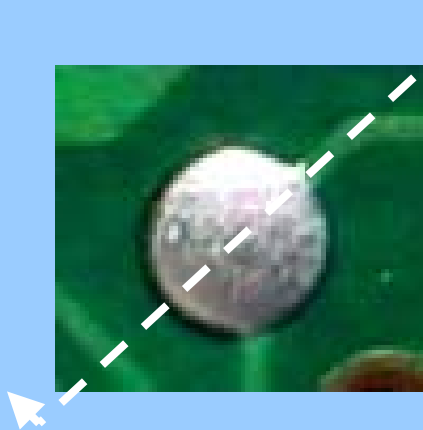
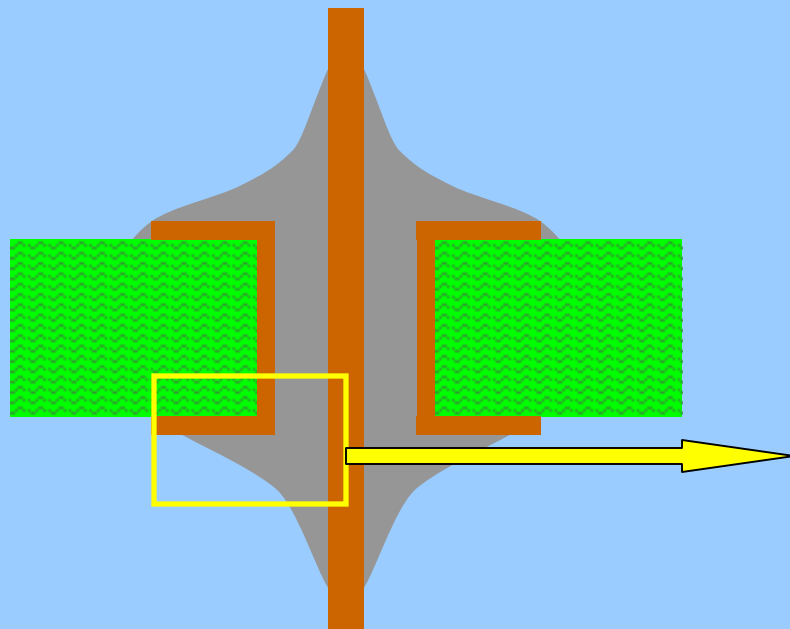


# Copper Leaching

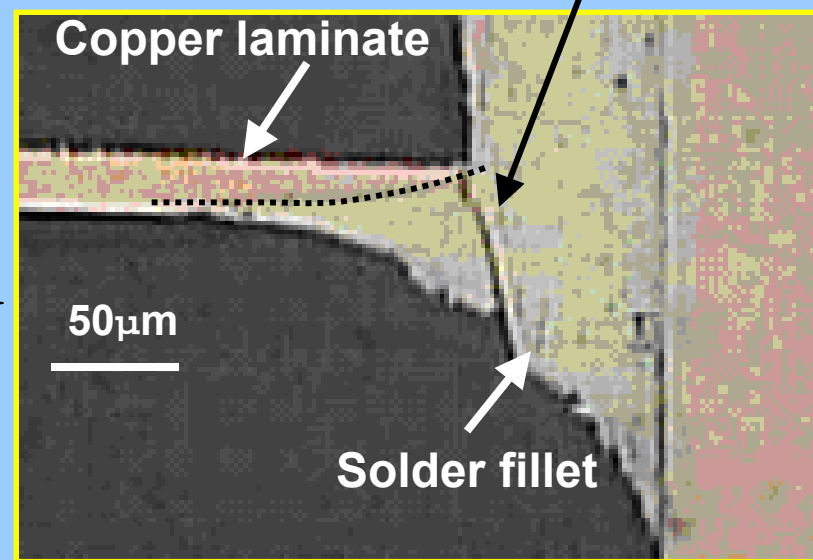


**SAC305**  
**250°C, 3.3 seconds**

# Copper Leaching



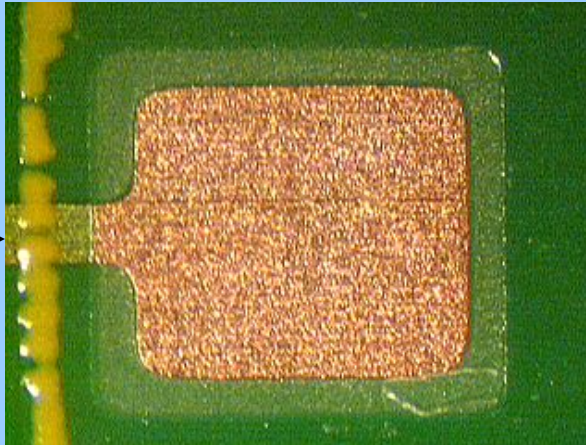
Erosion of copper at corner of through hole results in cracking



**SAC305**  
**250°C, 3.3 seconds**

# Copper Leaching

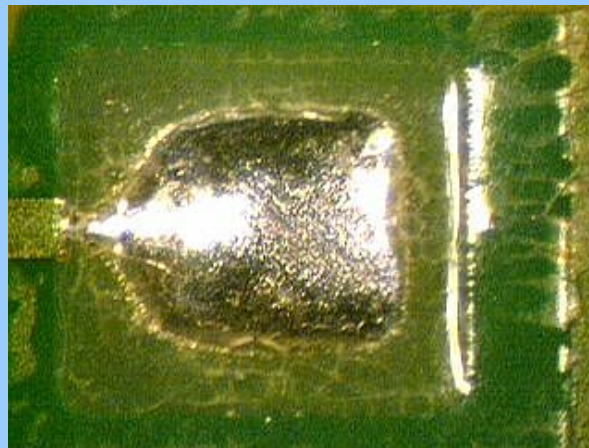
Original Pad  
18 $\mu$ m Copper



After 6 passes of Wave Soldering  
105°C Preheat, 256°C Solder Temperature, 4 seconds contact time



Sn-37Pb



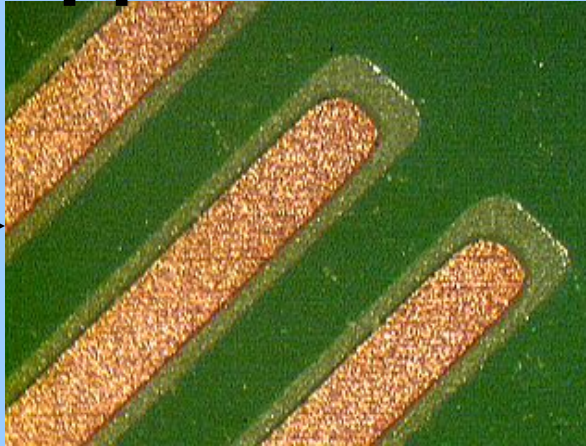
SAC305



SN100C

# Copper Leaching

Original Pad  
18 $\mu$ m Copper



After 6 passes of Wave Soldering  
105°C Preheat, 256°C Solder Temperature, 4 seconds contact time



Sn-37Pb



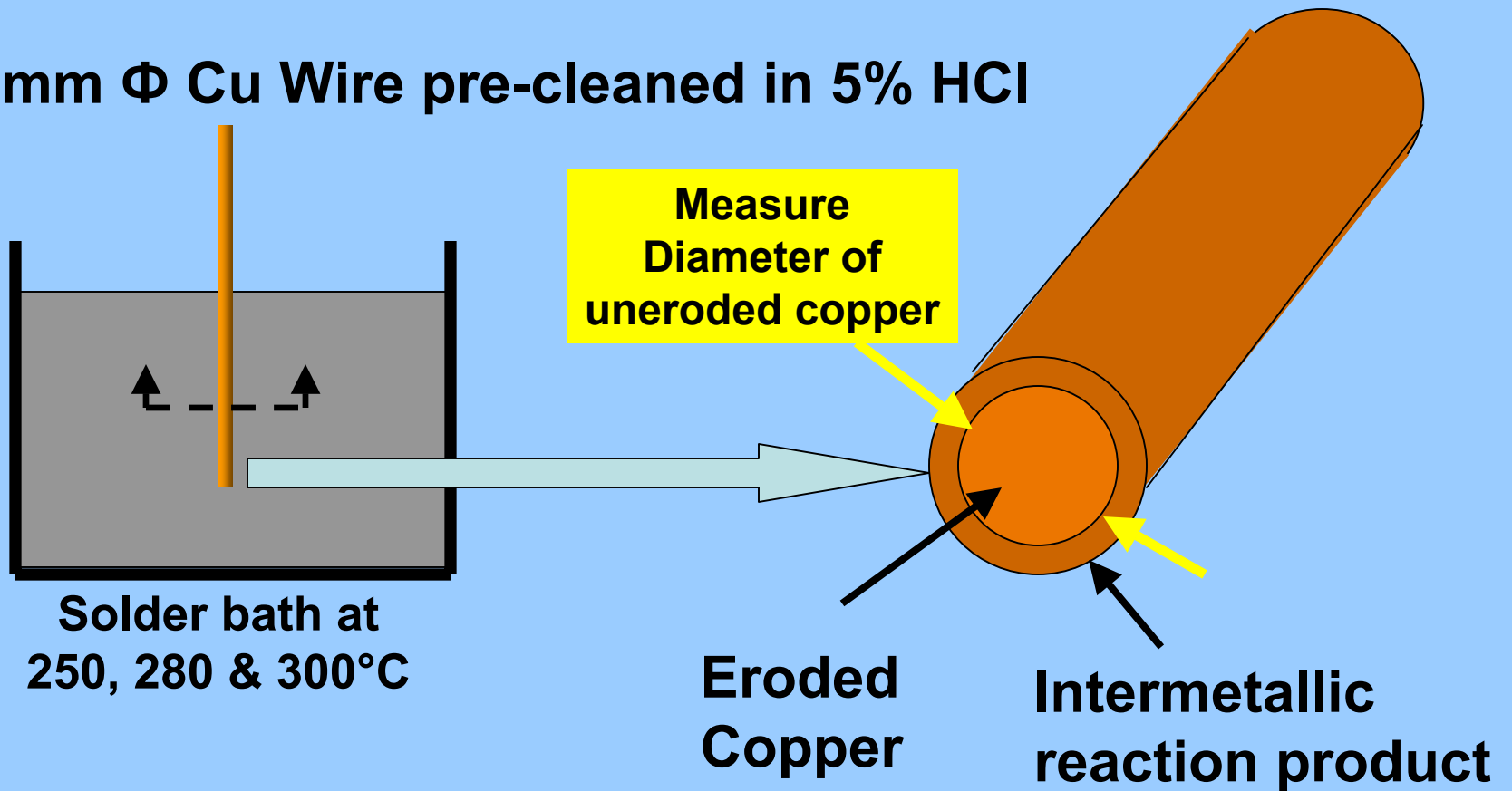
SAC305



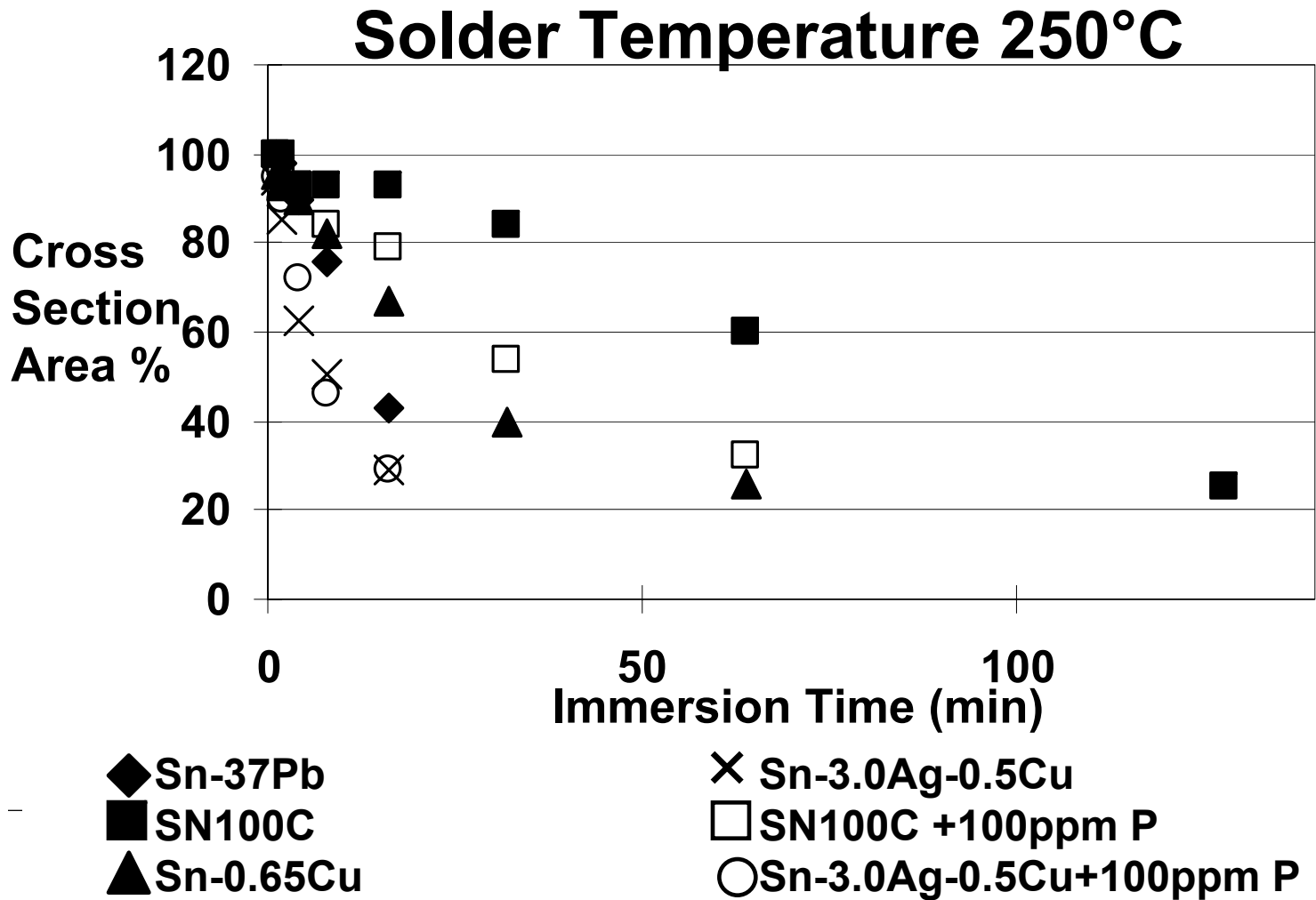
SN100C

# Study of Copper Erosion

0.44mm  $\Phi$  Cu Wire pre-cleaned in 5% HCl



# Study of Copper Erosion



# Increasing Reactivity Towards Copper 250°C

Sn-3.0Ag-0.5Cu

Sn-37Pb

Sn-0.7Cu

+Ni

A Factor  
>5

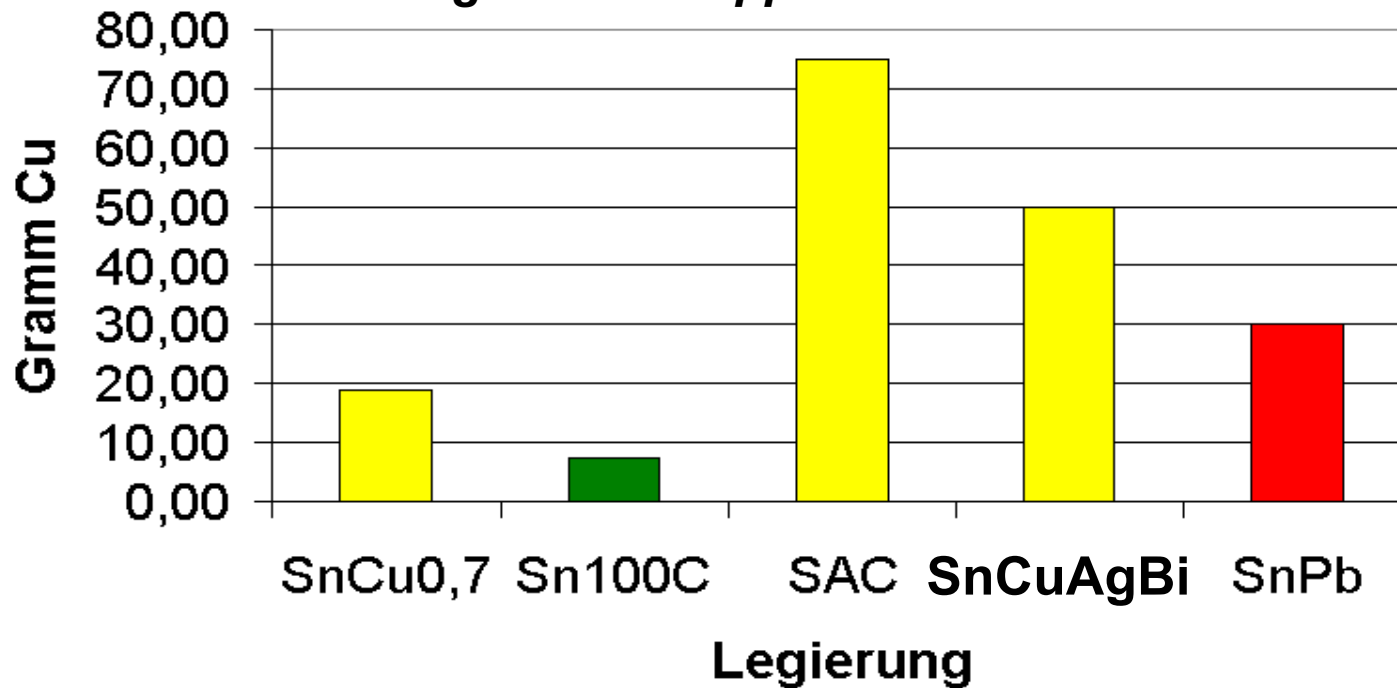
SN100C

# What about SnCuAgBi?

## Balver Zinn Copper Leaching Experiment

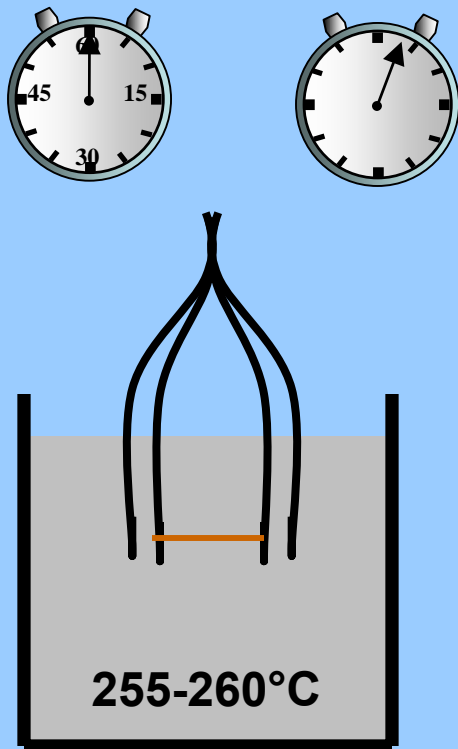
**Cu-Ablösung (Leaching) in Gramm pro Stunde bei 270°C**

*Leaching Rate of Copper in Solder Wave at 270°C, g/hour*



# What about SnCuAgBi?

## FCT Assembly Copper Leaching Experiment






### Time to Wire Break

63/37 Sn/Pb: 15 minutes

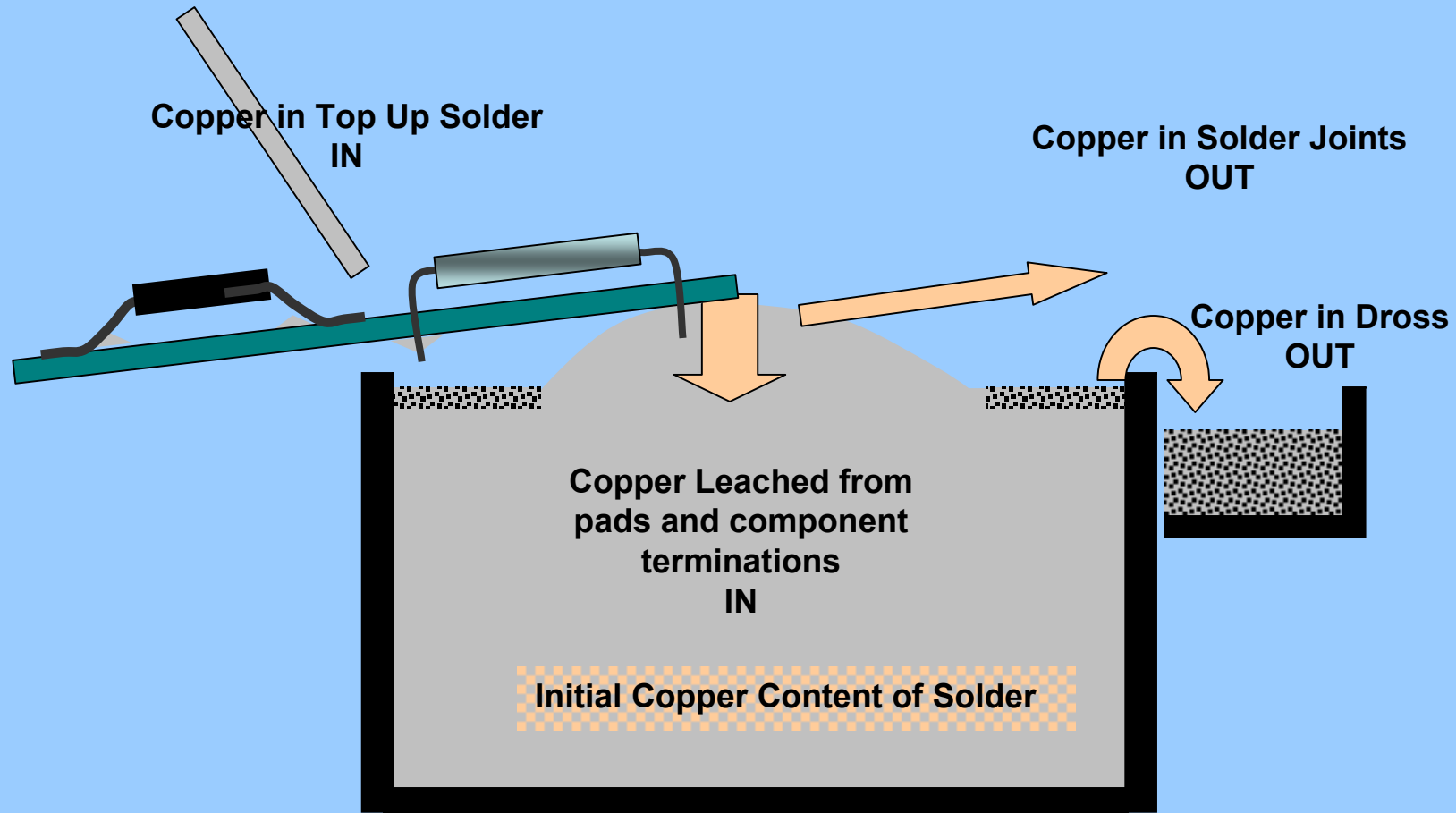
SnCuAgBi: 25 minutes

SN100C: 50 minutes

# SAC305 vs SN100C

Feature	SAC305	SN100C
Appearance	Dull <b>X</b>	Shiny 
Microcracking	Extensive <b>X</b>	Minor 
Cu Leaching	High <b>X</b>	Low 

# Managing Copper Content of Solder Bath

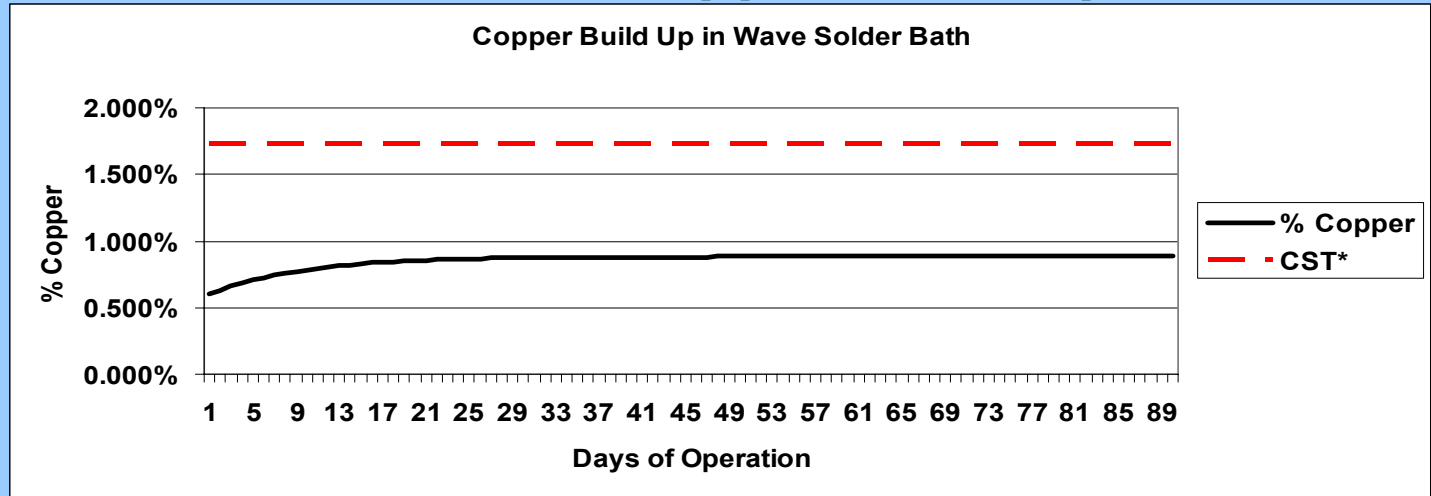


$$\text{Copper in Bath} = \text{Initial Copper} + \text{Copper in Top-Up Solder} + \text{Copper Leached from Board} - \text{Copper in Solder Joints} - \text{Copper in Dross}$$

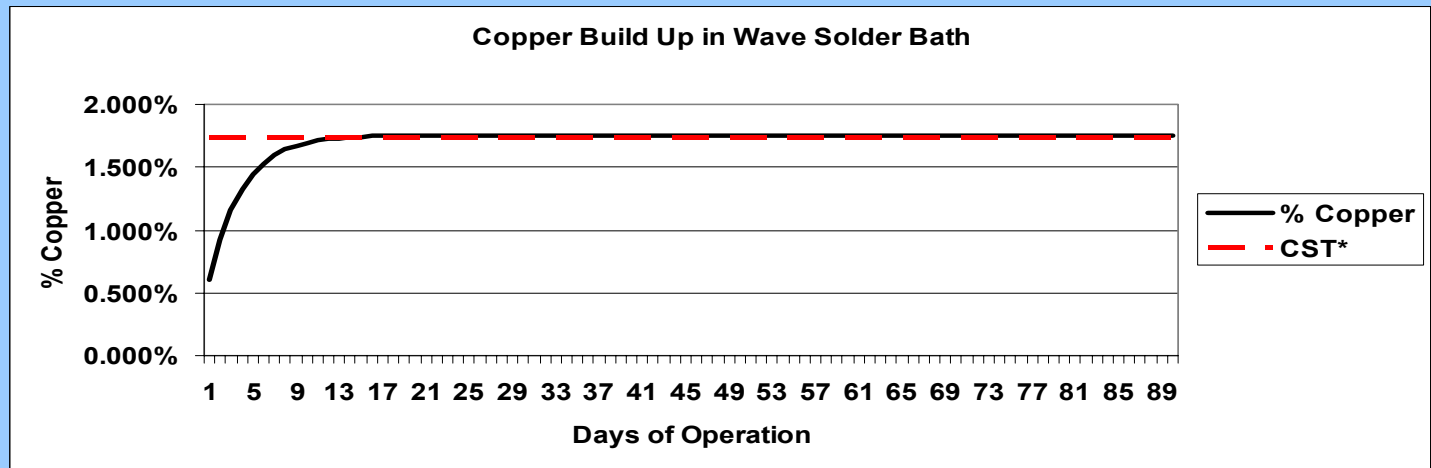
# Managing Copper Content of Solder Bath

## Mathematical Model of Copper Build Up

Low  
Copper  
Dissolution  
Rate

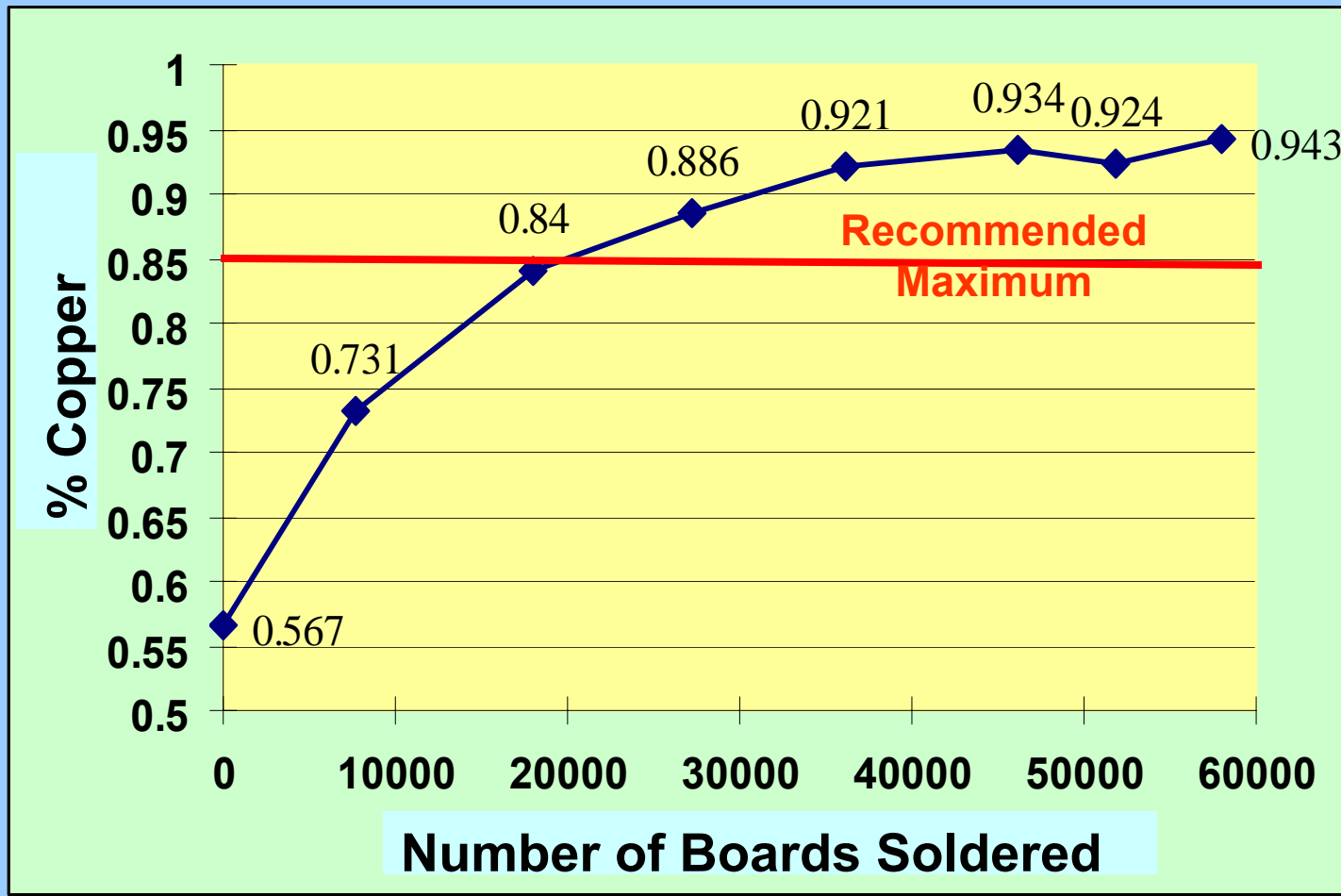


High  
Copper  
Dissolution  
Rate



# Managing Copper Content of Solder Bath

Copper level will exceed limit because of leaching



# Managing Copper Content of Solder Bath

If leaching rate with SN100C is low enough copper level can be controlled by the use of a low copper top-up alloy

