

# **Conventional and Microwave Assisted Processing of Cu Loaded ICAs for Electronic Interconnect Applications**

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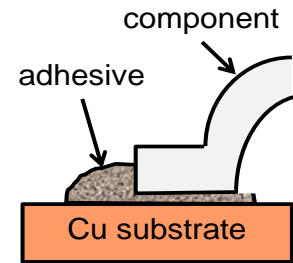
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# Interconnections & printing technology

- Printed electronics: *printing methods used to create electrical devices on various substrates*
- Ag filled inks / pastes provide good conductivity, **but with high cost**
- Cu replacement of Ag is difficult due to the non-conducting CuO



Component attachment



Printed tracks



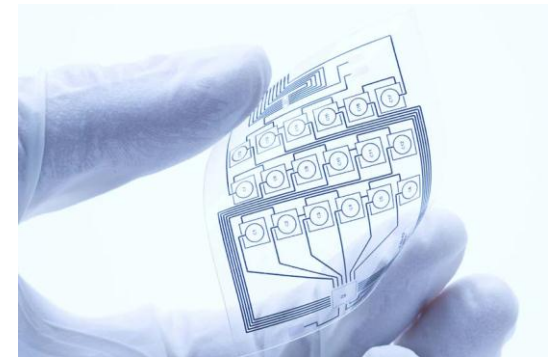
Screen printing

Yudu™ Screen-Printing System



Ink-jet printing

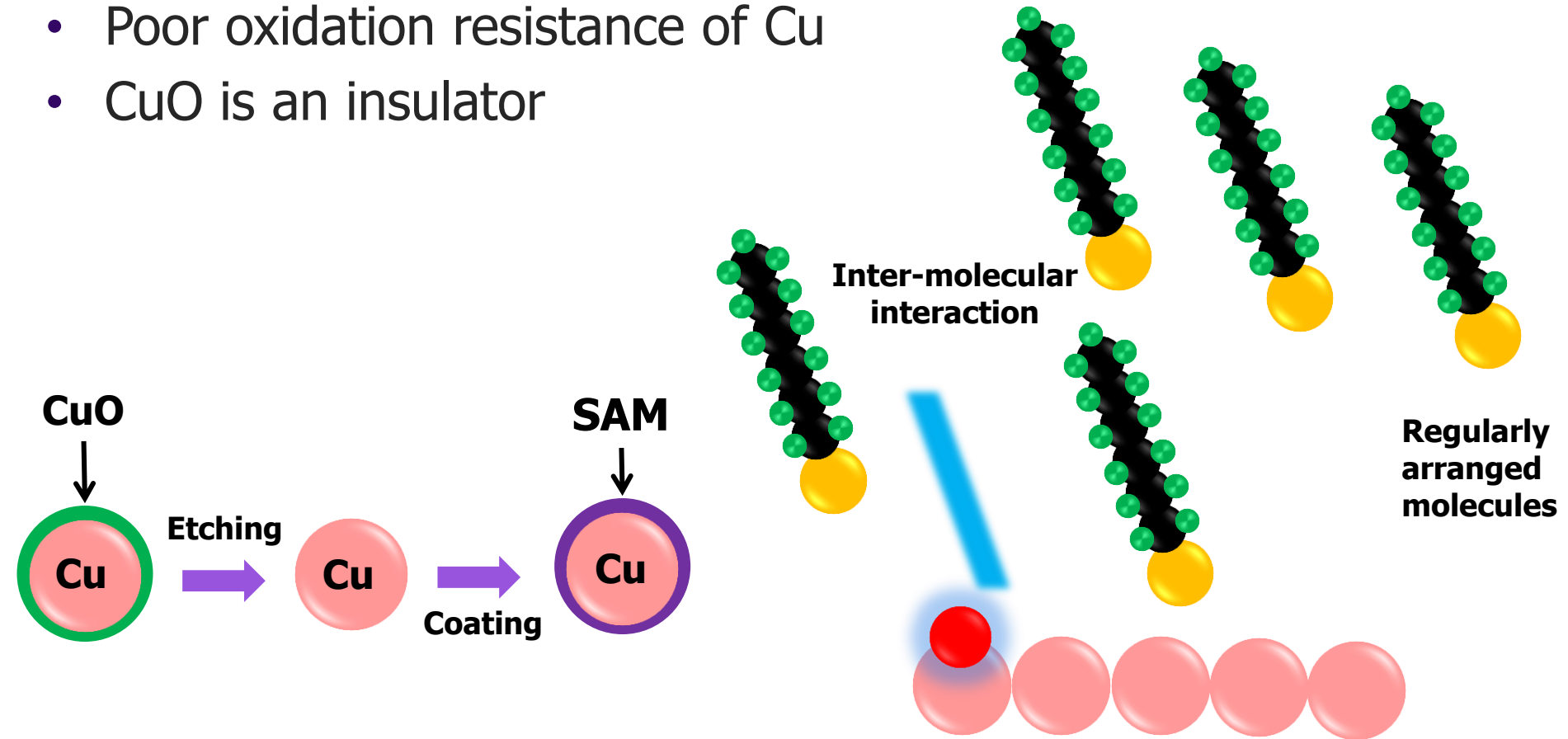
Fujifilm-Dimatix Materials Printer



Flexible electronics

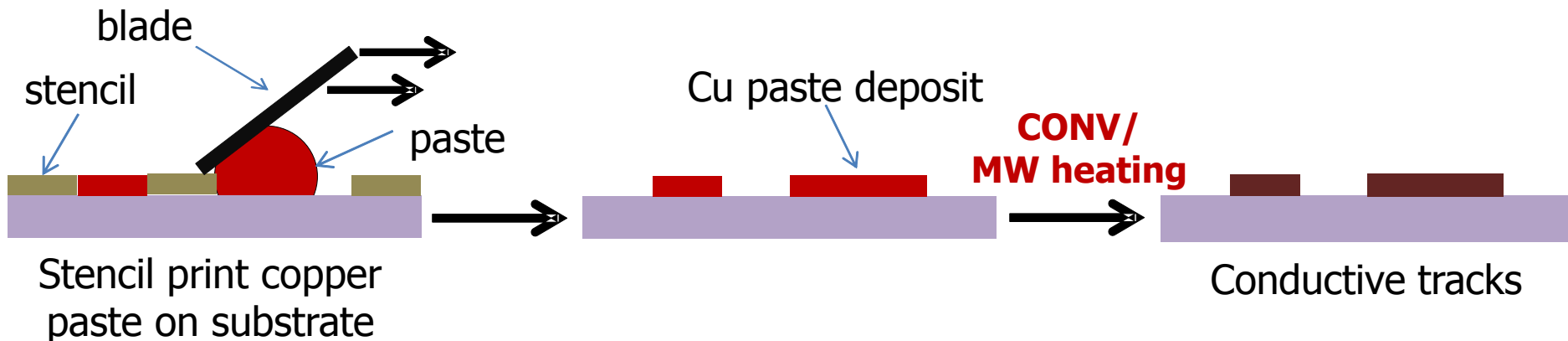
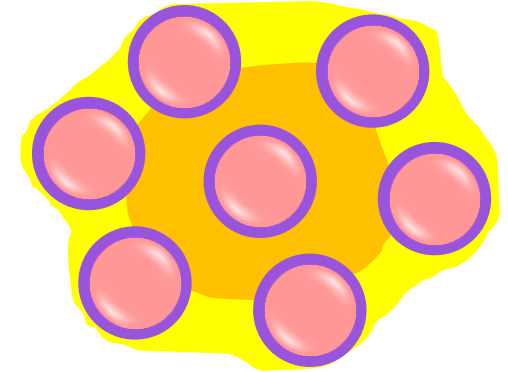
# Cu powder functionalisation

- Poor oxidation resistance of Cu
- CuO is an insulator





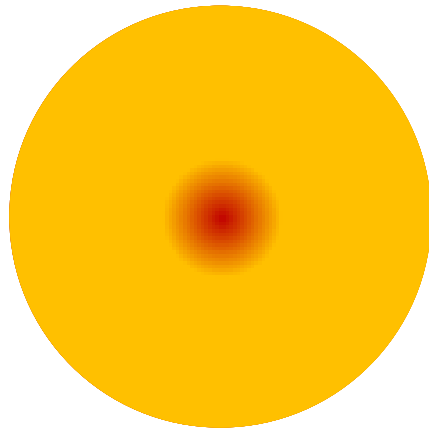
# Cu filled ICAs development

- Protected Cu powder mixed with resin to make a conductive adhesive
  - Coating **breaks down** during curing
  - Particles make metal-metal contact
- Using Cu provides raw **metal cost saving**
  - Silver >100x more expensive than copper

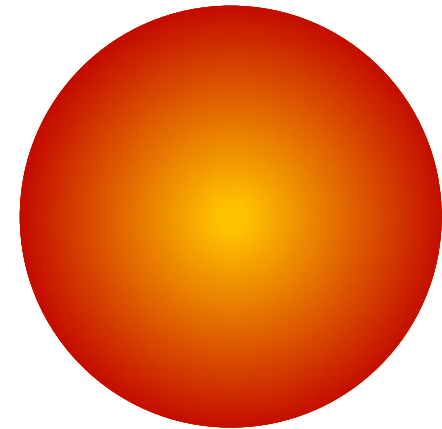


# Microwave vs. conventional heating

-  Lower temperature
-  Higher temperature

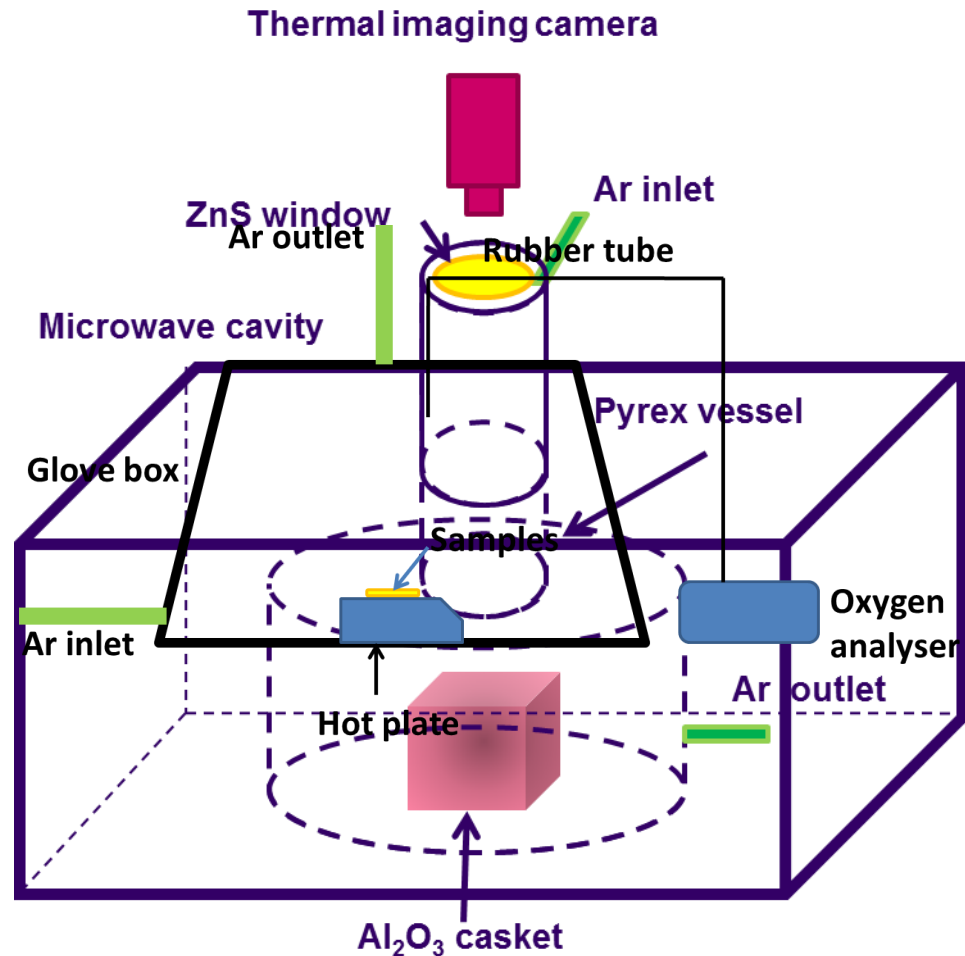


Conventional heating  
**Outside – In**



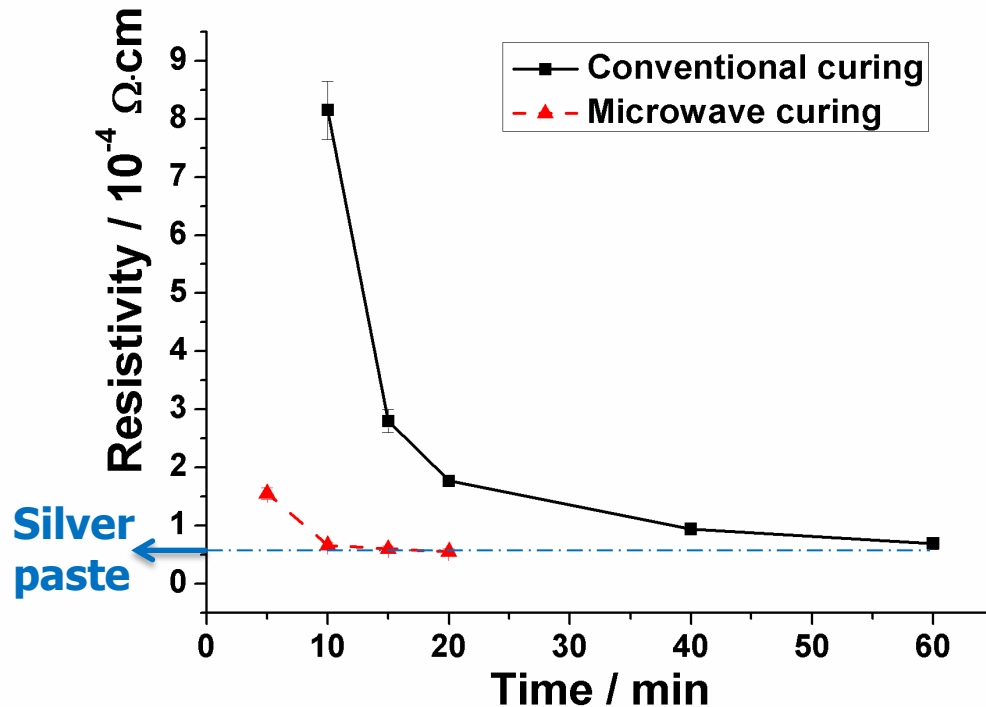
Microwave heating  
**Inside – Out**

# Conventional vs. Microwave system



- Ar atmosphere is required
- Thermal imaging camera is used for temperature measurement
- ZnS window has been calibrated for temperature measurement
- ZnO and SiC are used as Secondary susceptors

# Resistivity of cured ICAs



- Curing temp: 150 °C
- **Faster curing** can be achieved by microwave [1]
- Resistivity comparable to commercial Ag paste

[1] S Qi et al, *J Mater Sci*, 2013

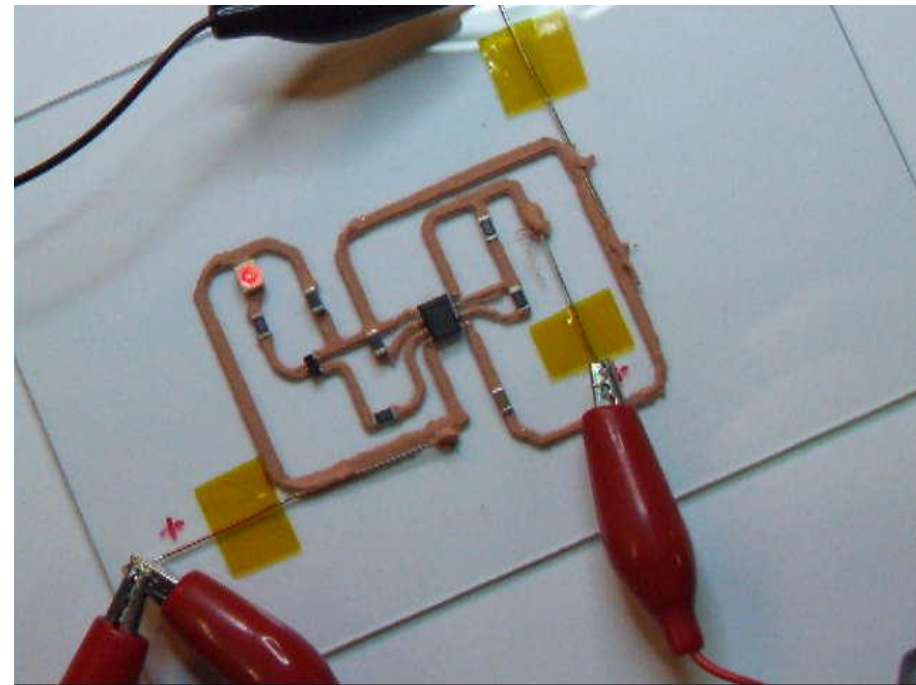
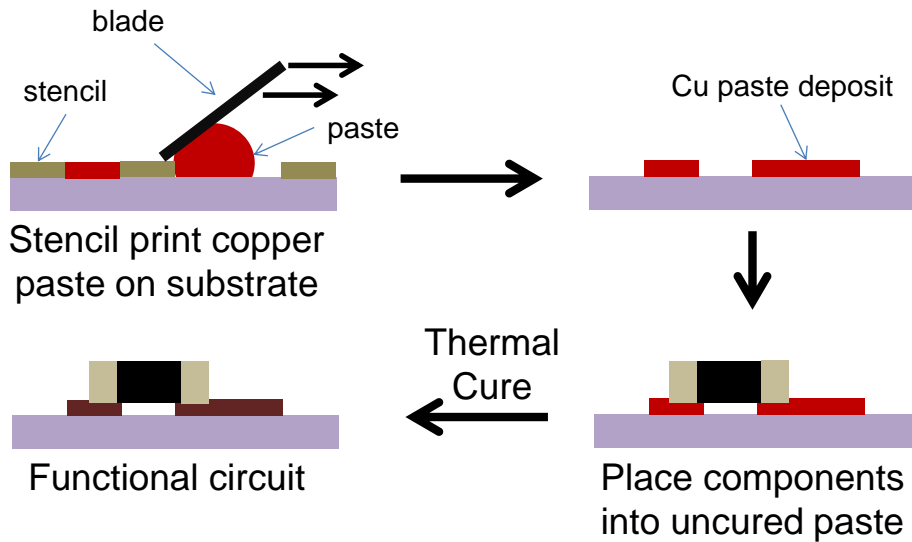
# Conclusions & summary

- Oxidation protection of Cu micron particles using SAM
- Conventional / microwave curing of Cu filled ICAs
- Resistivity of Cu filled ICAs are comparable to Ag filled ICAs
- Energy saving & raw material cost saving



# Functional printed Cu circuits

- Conductive adhesive enables combined circuit fabrication and component attachment



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**THANK YOU  
FOR YOUR ATTENTION**

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