



Digital printing with inorganic materials: technology focus



T T P

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METEOR

presentation scope

- the challenge of applying new materials
- issues and innovations in inkjet printing of new materials

challenge of applying new materials

- to get the functional materials into the right place at high throughput
 - enough material (depth, density etc)
 - accurate placement relative to itself and other materials
 - high throughput to achieve an acceptable return on capital



credentials

- TTP is largest *independent* development services company
- concept to production and each stage in between
- dozens of projects every year
- involved in digital print technology for two decades
- development of physics-based applied technology and the development of engineering-based systems and products



some application methods used at TTP

- taking small amounts from a large source and then dispensing them to make a pattern
 - liquid toner delivery
 - thermal transfer systems
 - thermal inkjet printheads
 - micro-pipetting
 - valve jet
 - continuous inkjet systems
 - novel piezo droplet systems
 - **industrial piezo inkjet systems**

example 1

supply of custom development rigs

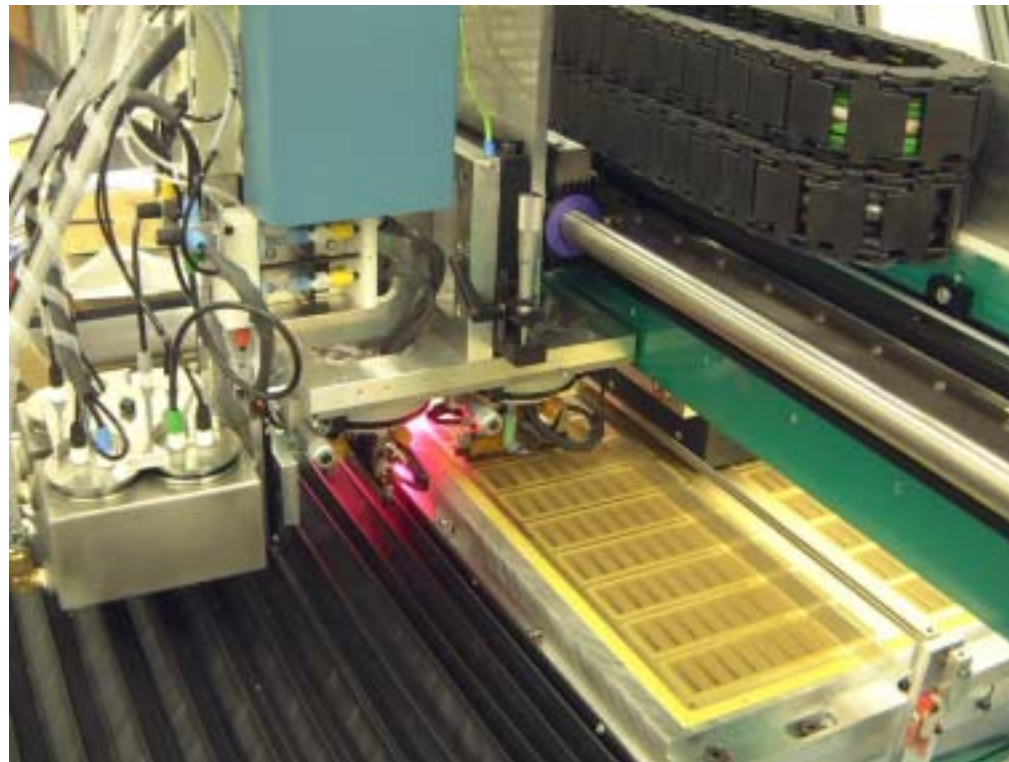
- e.g. for printing passive electronic components onto pcb material



example 2

development of processes

- creating new IP on how to use new inks to address commercial applications



example 3

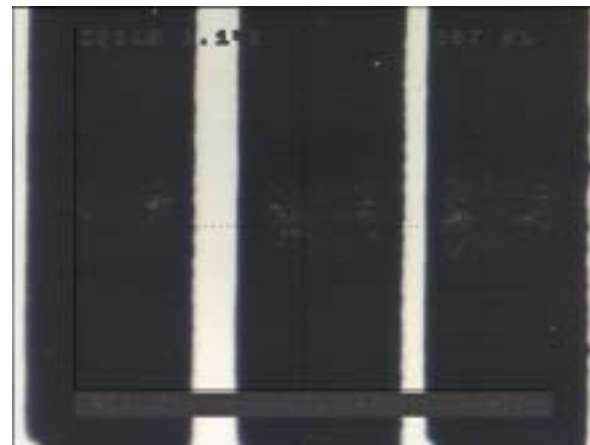
supply of printhead evaluation kits

- based on TTP's Meteor production-ready printhead drivers
- supports Dimatix (Spectra), Xaar and other printheads
- capable of extension from small evaluation systems to production systems with many heads



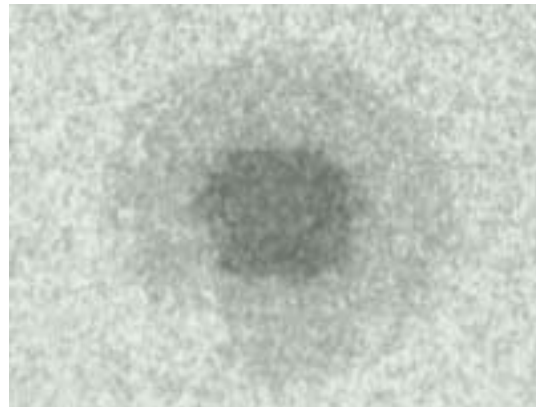
issues and *mitigations* 1

- surface tension is too high for wetting on substrate
 - *pre-treat the substrate with ozone*
- incompatibility with head
 - *test with available heads and then change head later*



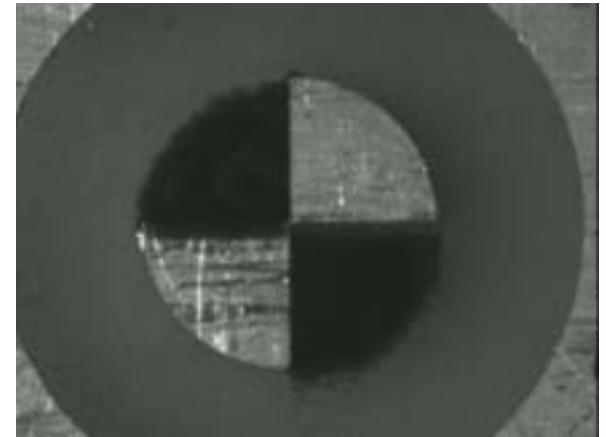
issues and *mitigations* 2

- viscosity for jetting is too low for easy application
 - *use heated substrates to drive off solvents*
- topology of substrate controls behaviour after landing
 - *dry very fast*
 - *turn it to advantage*



issues and *mitigations* 3

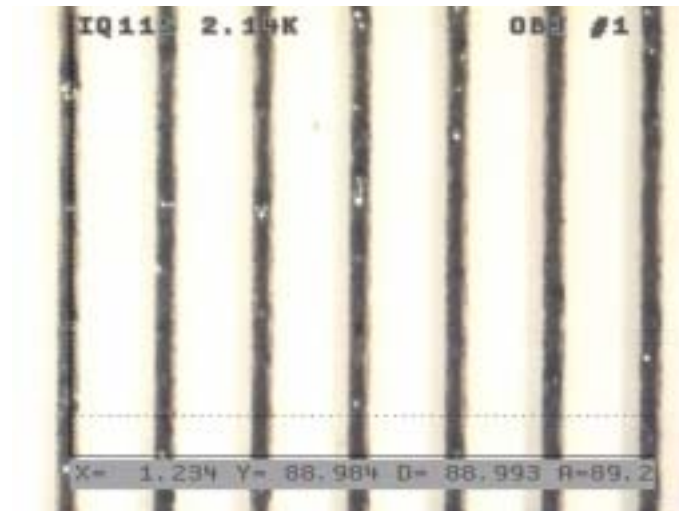
- for small drops the air controls the landing site
 - *use bigger drops and move slowly*
- pattern data format is not image data format
 - *develop a custom translator that copes with large drop sizes*
- digital print costs for high resolution are unacceptable
 - *force acceptance of new standards*
- target is stretchy and misaligned
 - *adjust data after viewing fiducials*



some highlights 1

creation of high aspect ratio conductive tracks

- 20um x 20um cross-section



some highlights 2

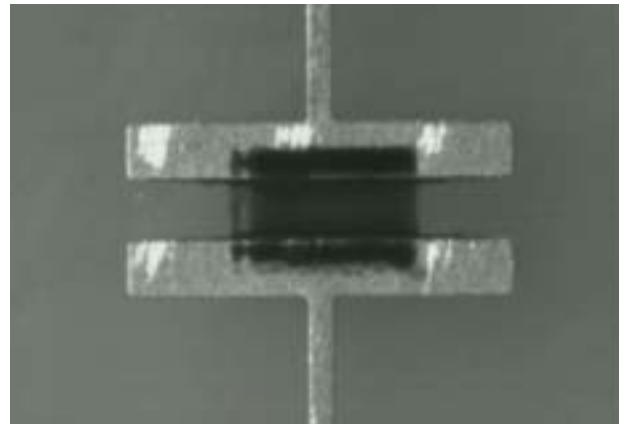
novel chip interconnect method

- suitable for high-throughput reel-to-reel production of RFID interconnect tags

some highlights 3

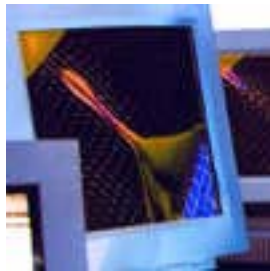
functionality testing

- alignment of inkjet to stretched, rotated and misaligned copper patterns



some future improvements

- inkjet dispensing of dynamically-maintained dispersions
- non-contact dispensing of droplets of toners using Tonejet
- reduced development time to evaluate inkjet and to take systems from evaluation to production through use of Meteor drive components



summary

- meeting a market application requires both innovation in materials and innovation in the process for dispensing
- these engineering-based innovations are coming
- IP will be protected in the process method as well as the materials

thank you

- to contact the speaker email **clive.ayling@ttp.com**
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- for more information on inkjet innovation and engineering-based development services visit **www.ttp.com**



- for more information on purchasing production-ready drivers for inkjet systems and/or evaluation kits for inkjet printheads visit **www.ttpmeteor.com**

