Proceedings ECS 2019
Heidelberg, Germany, September 8-11, 2019

Abstract T-41

Selective inkjet coating of Printed Circuit Boards with paraffin wax

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Abstract
The protection of PCB's is done by coating a protective film of wax over the boards. In this work it showed, that inkjet printing is a fast, accurate and economically competitive way to selectively coat PCB's. The proposed process by 3Diam AG has been developed with the core competences of iPrint and is currently adapted for mass production.

***Keywords**: Inkjet, Coating, Digital, Wax, PCB*

1. Introduction

For protection against moisture and consequent corrosion, printed circuit boards (PCBs) are coated with a protective film. The main current methods for electronics coating are spray painting and micro dispensing. Spray painting methods are fast but have a poor resolution and require complex infrastructures with pressurized supply lines and air filtration systems. Micro dispensing, e.g. with pressure cavity pumps, is a selective and precise process at the price of speed. Furthermore, micro dispensing is expensive and cannot be easily parallelized.

Inkjet printing is a fast growing solution for selective coating. Inkjet offers high resolution and high printing speed.

2. Theory

Commercial piezoelectric print heads have native resolution of hundreds of nozzles per inch, with each of those nozzles being individually addressable and able to jet in the kHz range.

For the considered application, PCBs come in with variable shapes and have electronic components with a height of up to 15mm assembled. To be economically competitive, the coating process developed within this project should take less than 5s/PCB and be operated 24/7.

3. Experimental procedure

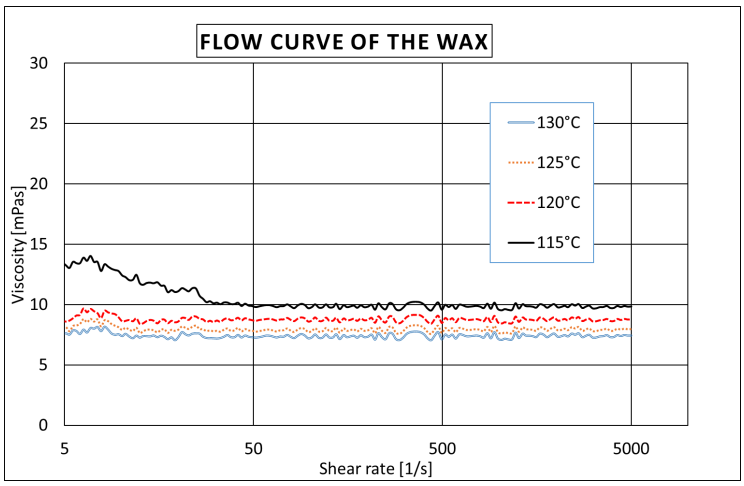

Figure 1: the wax has a Newtonian behavior at temperature above 115°C, with a viscosity of about 8.5 mPas

The coating material used was a paraffin-based wax with a melting temperature of 105°C. The main steps of the project were the wax characterization, the selection of an inkjet print head and the coating process development.

PCBs with dimensions of 300x80mm with electronic components with a height of 15mm were successively coated in selected areas with a resolution of less than ±0.1mm

4. Results and discussion

The selected print heads for the project were Fujifilm-Dimatix Galaxy 256/80 HM. Optimal temperatures for the PCBs, printing chamber and the print heads were investigated. The PCBs had to be pre-heated to ensure the adhesion of the wax droplets on their surface.

The required printing distance of more than 15mm to coat those PCBs was achieved by tuning the waveform with a drop watching analysis.

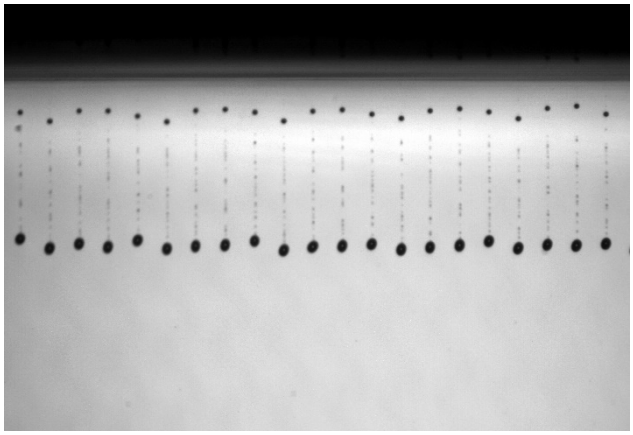

Figure 2: waveform tuning with 780 pL and 6m/s

Controlled coating thicknesses of 50-500µm were printed using multi pass and greyscale printing. Vertical structures up to 15mm were coated using only substrate displacement.

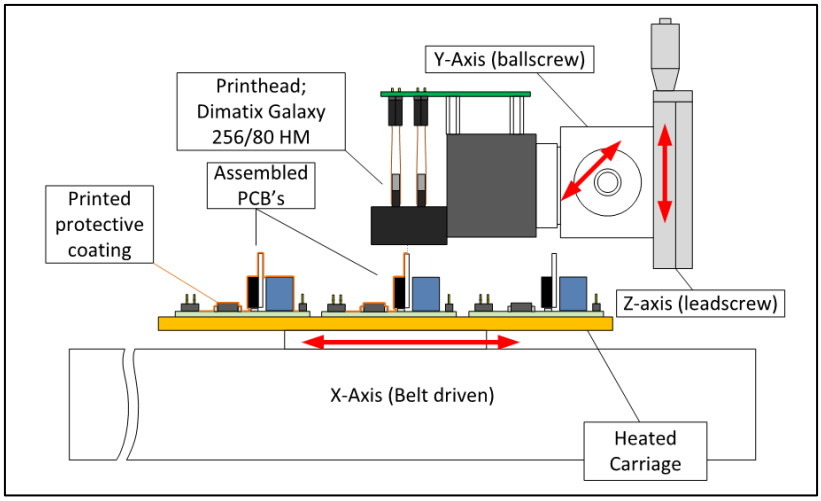

Figure 3: schematic drawing of the used inkjet printing set-up

5. Conclusions

The current set-up allowed us to print a wax protection layer at 120°C on PCB by forming defect free and high quality protection layers. The work showed, that well defined and optimized waveforms combined with well controlled temperature conditions allows to print dense and homogenous wax protective layers.