

Introduction

Inkjet printing is a versatile process, with applications covering a broad spectrum. **Printed electronics** is one such field where inkjet printing, due to its suitability, flexibility and relative simplicity, finds its application. Typically, **metal nanoparticle** based inks and **polymer** based inks are used in inkjet printed electronics to fabricate conducting tracks and circuit components (e.g. resistors, capacitors etc.), respectively. For this research, a piezoelectric **drop-on-demand** inkjet printer (Figure 1) from MicroFab Technologies Inc. is made use of.

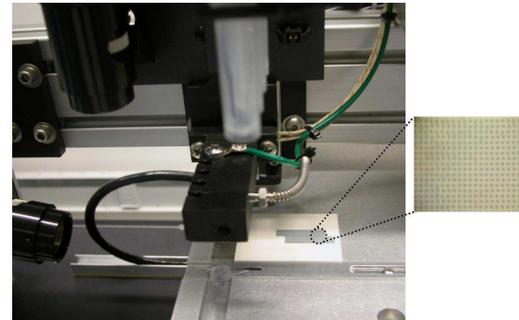


Figure 1: Inkjet printing at University of Twente with MicroFab Jetlab - IV.

Objective

The principal objective of this research is to understand and characterise the **adhesion** between printed tracks/components and substrate in a quantitative, qualitative and comparative manner. Since the durability and utility of inkjet printed electronics hinges on the extent to which the printed entity attaches itself to the substrate, this characterisation is of paramount importance. Adhesion is characterised at room temperature, elevated temperature and after thermal cyclic loading, to ascertain the influence of fatigue on adhesion.

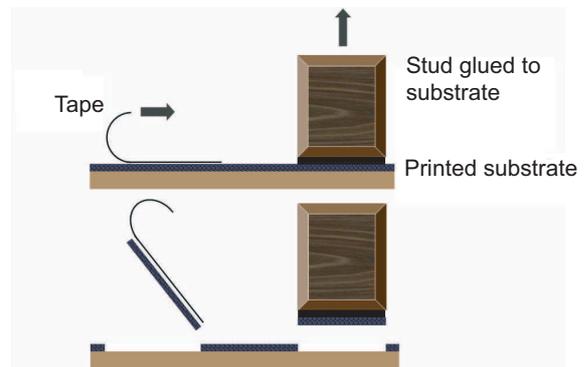


Figure 2: Scotch tape test and pull-off test before (top) and after testing

Methodology

Scotch tape test, a qualitative test, and **Pull - off test**, a quantitative test, are used to determine the adhesion between a rigid substrate and the printed entity (Figure 2). For the sake of comparison, **spin coated substrates**, with layers spun using the same inks as the ones used in inkjet printing, are tested as well. For this purpose, a basic spin coating setup has been developed in-house. A difference in adhesion values is expected, as spin coated layers are more continuous and uniform than their inkjet printed counterparts (Figure 3). It could be envisaged that the difference in adhesion values will be highly influenced by the surface characteristics of the substrate material. To ascertain this influence, different substrate materials with varying surface characteristics will be subjected to testing.

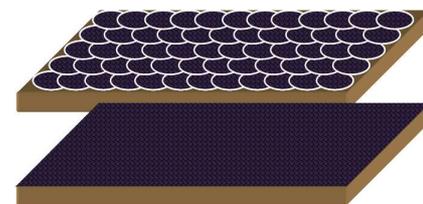


Figure 3: An illustration of spin coated (foreground) and inkjet printed substrates.

References

1. ASTM D4541