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Inkjet-printed silver tracks on different paper substrates

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Abstract

Inkjet printing is a widely used patterning method in industrial and scientific applications, and has also drawn attention in the field of printed electronics in recent years [1]. In this work, conductive silver tracks were achieved by inkjet printing of a commercial silver nanopaste (Harima NPS-J) onto two types of commercial photo paper and chromatography paper. The printed line width was varied between 100 µm to 2 mm for both dimensional and electrical characterizations to be made. The number of layers and the sintering temperature were investigated to optimize the fabrication process. The scanning electron microscope (SEM) images in Figure 1 show the difference in the silver ink at room temperature and after sintering at 160°C for 2 hours on Epson photo paper. The silver track on the photo paper was found to have similar conductivity as bulk silver. Chromatography paper is very significant in paper based microfluidics research - when silver inkjet printing is combined with paper based microfluidics, advanced features such as digital readout and electrochemical sensing can be achieved [2]. However, the resulting conductivity on the chromatography paper was not as high as on the photo paper, and printing of multiple layers is necessary to obtain acceptable conductivity. The inkjet printing of silver (and possibly other cheaper conductive materials) on paper will be a key component in the development of successful low cost micro manufacturing techniques and point-of-care devices.