Contribution ID : **137** Type : **Oral**

Applications of Synchrotron Light in Inkjet Technology

Thursday, 20 November 2014 11:30 (20)

Memjet is a privately held technology company that develops printheads and associated technology for high-speed, low cost digital colour printing. The Memjet Waterfall Printhead Technology comprises a page width printhead made up of 70,400 nozzles, which can continuously fire up to 700 million drops per second. A typical A4 page can be printed in one pass, without scanning back and forth, in 1.6 seconds at 1600 x 800 dpi.

The nozzle size and density on a Memjet printhead creates special requirements for contamination control and maintenance design. Each nozzle is 31.7 um across and contamination in such small nozzles or, indeed, the ink fluidic channels, will show up as fine streaks on paper when ink flow to nozzles is blocked. This can become a more serious problem if a number of closely spaced nozzles are starved of ink.

Due to the size and location of contaminants in nozzles and fluidic channels it can be a challenge to identify them by routine FTIR. This was true for one particular field problem where identification of contaminants blocking nozzles was required. However, the high brilliance and spatial resolution of synchrotron IR light enabled identification of printhead contaminants. This led to a rapid customer response and a rethink in maintenance operation.

Moreover, FTIR analysis of the silicon oxide roof layer of printheads showed differences in the nature of the layer across the printhead. Indeed, some of these differences correlated with print quality degradation. Follow up work on the WAXS beamline to comprehend the layer structure in more detail found a predictor peak that changed significantly in intensity between good and bad print quality regions. The position of the peak at 2.57 A-1 suggested it came from a crystallographic form of silicon oxide - possibly alpha quartz.

The FTIR and WAXS investigation clearly showed there were differences in surface chemistries across printheads. This information and other supporting data helped improve our understanding of the wetting behaviour across printheads and the impact on print quality.

Keywords or phrases (comma separated)

Summary

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Session Classification : Working with Industry