Materials for Digital Printing

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Abstract

With the advancement in microprocessors and nano-technologies, non-impact printing has transitioned from analog to digital and is migrating from monochrome to color. The digital color-printing offerings have extended from home and office up to the production-printing segment. Digital color printing technologies have continually evolved in an effort to meet the intense customer demand for lower price per page, greater reliability/image quality, and a broad range of applications. These advances could not have been made without the critical role that xerographic materials have played. Life extensions with the ability to achieve high toner transfer efficiency and clean-ability for photoreceptor and intermediate transfer belt has been an intense focus in this industry. The rapid expansion of chemical toner technologies has enabled new applications and offered new opportunities. This talk reviews the market trends in printing, the technological challenges of meeting the market requirements, and the material developments, which have supported the digital color printing advances.

Market Trend and Technological Challenges

The major trends that have been affecting the printing industry in the past decade, and which will continue to be major factors in the future, are the digital transition, the migration of monochrome pages to color pages, the intense pressure to reduce the price per page to customers, especially for color pages and the technology developments that will enable us to meet these challenges. Constant customer demand of low cost per page has driven the printing system architecture to be simple with fewer components for service and the hardware components design to be smaller, more reliable and to yield longer life with increasing levels of remanufacturing and reuse. However, both long life and architectural simplicity can impose much more complicated performance requirements on each component. The performance demands are even more challenging in production printing market due to its predominantly graphic-based color images and the use of a wide range of substrates. The complexity of each component design has increased in order to meet the performance requirements and to provide a system benefit and value to the customers. In addition, the increasing concern of environmental health has significantly affected how the printing components and xerographic materials are manufactured, handled, and disposed, which in turn determine how the technologies are being developed and utilized.

Xerographic Material Development

The designs of the key xerographic components, toners, photoreceptors, intermediate transfer belts or drums, and fusers, have evolved into complicated multi-layered structures with each of the layers designed for specific functions in order to meet the required performance challenges. The uniformity of each layer also has to be critically managed within microns for high quality color graphic images. A multi-layer structure offers many degrees of freedom in the choice of designs to provide the best system advantages, but also requires critical attention to their interfacial and surface properties. The newly emerged chemical toner technologies have provided such an advantage over the traditional technologies in the design of high performance toners.

Author Biography

John R. Laing is Senior Vice President of the Supplies Delivery Unit in Xerox, responsible for the multinational design, development, and manufacturing and sourcing of toner, developer, photoreceptor, print cartridge, and fuser products. Laing joined Xerox in 1977 in the technology group designing toner materials. Since then he has held a variety of technical and management positions. In 1988 he won the Xerox President's Achievement Award. Laing received a B.Sc. degree in Mathematics and Chemistry from the University of Toronto; a Ph.D. in Chemical Physics from the University of Chicago, and most recently obtained his MBA as part of the Executive Development Program, Simon School, University of Rochester. He has issued nineteen scientific publications and has been awarded 13 US patents.