

Time-Resolved Studies of Color Bleed Diffusion Limited Reactions with a Micro-Reactor

Robert J. Miller, Ph.D.
RJM & Associates
Palo Alto, California

Abstract

The quest for relevant non-print based testing of the performance and reliability issues associated with ink-jet printing devices has been a pursuit of many for over 15-years. In this talk, a micro-reactor system that has been developed for time-resolved studies of diffusion limited reactions is applied to the color-bleed assessment problem. The micro-reactor consisting of a free-falling liquid film with at least one intersecting reactant streams. The resultant film exhibits surface-area to volume ratios on a par to that of adjacent printed dots. Once calibrated for a given set of pen parameters, the micro-reactor based instrument can accurately emulate the post-print droplet environment. In so doing, new ink systems may be pre-screened for color-bleed without the time consuming need to subject the system to a print test. A film thickness of 20-to-100-um has been used to assess various ink additives for eliminating color-bleed. The instrumental technique and methodology for evaluating the color bleed susceptibility of ink parings is presented.

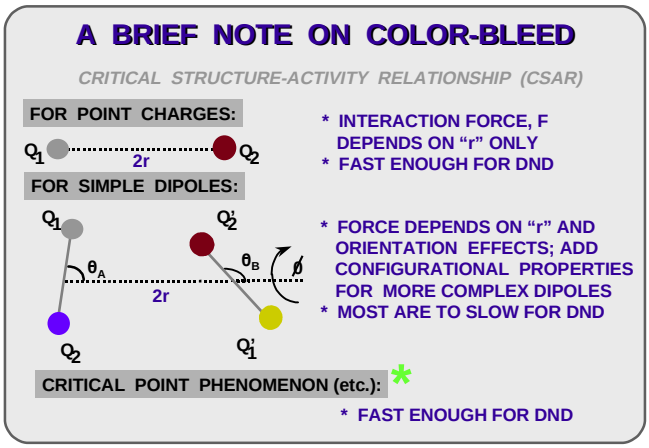

Figure 1 Schematic representation of dye-dye color bleed

Introduction

A schematic representation of the dye-dye based color bleed problem that is addressed in depicted in Figure 1.

The instrumentation schematic shown in Figure 2 below has been successfully utilized to assess rapid chemical reactions. Under the conditions shown below a 50-ms reaction time corresponds to an 8-cm fall.

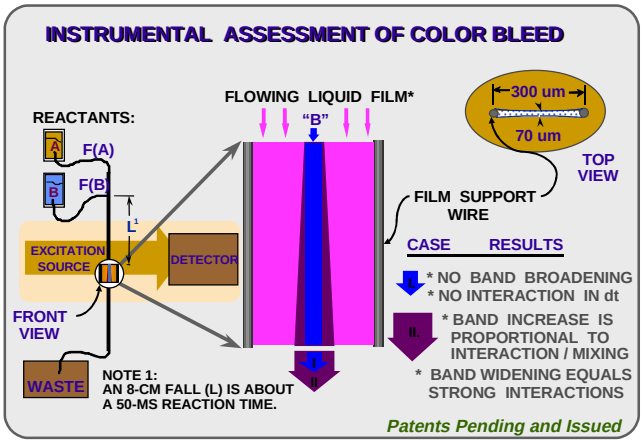

Figure 2. Schematic of Micro-Reactor

Summary

A novel means of assessing color bleed and other facilitated diffusion processes has been introduced in this paper. Reaction times of 50-ms are readily assessed.

Biography

Dr. Miller has spent 12+ years with Hewlett-Packard Laboratories developing new printing technologies and theoretical underpinnings for various components of the Thermal Ink Jet (TIJ) technology group. Prior to joining HP-Labs, Dr. Miller led a team of technical contributors that led to the successful introduction of the first commercial TIJ printer. Since leaving HP-Labs, Dr. Miller founded RJM & Associates which consults in digital printing, computer simulations and micro-instrumentation.

Contact author's e-mail address – plato@best.com.