# Micron and Nanometer Sized Contact Pattern Replication: Advanced Stamping and Molding

**Kenneth R. Carter**

*Polymer Science and Engineering Department, 416 Conte Building, University of Massachusetts – Amherst, Amherst, Massachusetts 01003*

It is becoming increasingly complex and expensive to reproduce the small features needed for today's microelectronic devices. The need for new nano-technologies, such as patterned magnetic media, bio-sensing devices and smaller magnetic recording heads, has led to demands for new nanoscale designs and processing techniques. One of the thrust of my group is the development of polymeric materials used in novel contact molding techniques for the replication of precisely defined features. The degree of control of the chemistries of these materials is crucial, especially surface modification and reactive functionality. Our *Nanocontact Molding* (NCM) process and materials will be discussed. A related contact patterning project involves techniques for manufacturing PLED displays. In order to fabricate the red/green/blue subpixels, the materials set must be patternable on the desired length scale. We present an approach that uses blue emitting polymers as a base layer into which we selectively apply novel small molecule fluorescent red and green dyes via patterned contact dye diffusion. We entered into this study with the goal of demonstration and development of technology enabling creation of three color pixels in an PLED device. Additionally, the technology must be extendible to high resolutions (>5 μm subpixels) and be amenable to large area flat panel screen production. In the process a dye pattern is transferred from a dye transfer plate (PDMS-based) into a receiving layer (blue LED polymer) on a substrate by bringing the dye transfer plate into contact with the receiving layer. The pattern of the dye is maintained upon transfer and any subsequent diffusion steps. Preferably, the method is repeated to provide a three-color pattern in the receiving layer. Material synthesis, process development and characterization of actual devices will be presented.