# Multiscale model development of pattern nano-imprinting processes

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Nano-imprinting is an increasingly popular method of creating structured, nanometer scale patterns on a variety of surfaces. Applications are numerous, including non-volatile memory devices, printed flexible circuits, light-management films for displays and sundry energy-conversion devices. While there have been many extensive studies of fluid transport through the individual features of a pattern template, computational models of the entire machine-scale process, where features may number in the trillions per square inch, are currently computationally intractable. In this presentation we discuss a multiscale model aimed at addressing machine-scale issues in a nano-imprinting process. Individual pattern features are coarse-grained and represented as a structured porous medium, and the entire process is modeled using lubrication theory in a two-dimensional finite element method simulation. Machine pressures, optimal initial liquid distributions, pattern fill fractions (shown in figure 1), and final coating distributions of a typical process are investigated. This model will be of interest to those wishing to understand and carefully design the mechanics of nano-imprinting processes.

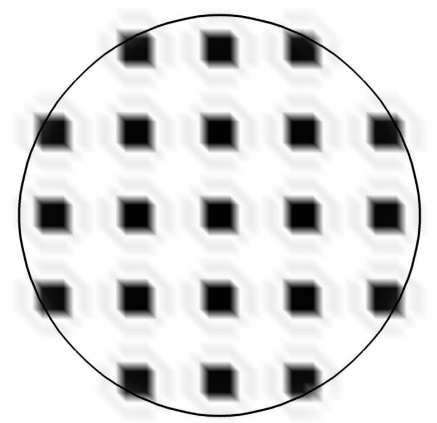

Figure 1: Illustration of a liquid drop spreading under a template. Dark regions represent areas of the template saturated with liquid.

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