

## Summer Research Program 2011/2012

### *Patterning Surfaces using evaporation*

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#### Objective

*The objective is to develop ways of forming lines of particles on a solid substrate. These will be used to form biological sensors and as a catalyst for growing nanoscale features.*

#### Description

*There are a number of methods of manipulating the location of particles, these include using ultrasonic, optical or magnetic fields, however each of these suffer from either being capable of handling only a small number of particles simultaneously or a poor scaling of force magnitude with decreasing particle radius. When a droplet of fluid is allowed to evaporate the suspended matter will be deposited, often left in a ring around the area the droplet once occupied as in Figure 1. The alignment is due to fluid movement as evaporation takes place, this means a nanoscale particle can be handled every bit as well as a microscale particle, as their trajectory is dictated by the fluid motion. Furthermore, the majority of the suspended particles are formed into these patterns. The major challenge then is to create methods to form more useful patterns than circles. Figs 2 and 3 shows ways of forming lines, but both require more complicated approaches than desirable. The task for this project is developing simple reliable approaches to form predetermined lines of particles. The project will require a development of the mechanics behind the process based on experimentally gathered evidence.*

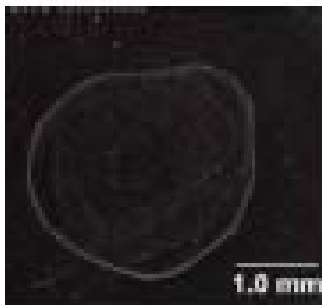


Fig. 1: a ring of 2µm particles left by an evaporating droplet

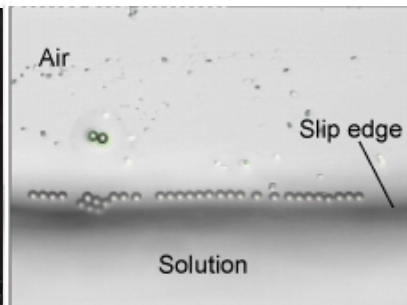


Fig. 2: a line of 5µm particles formed by slowly evaporating fluid under a cover slip

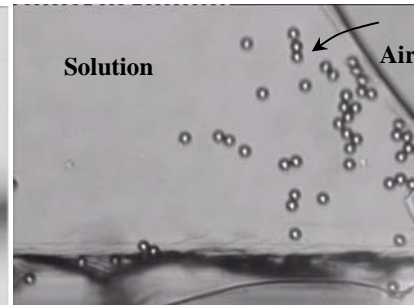


Fig. 3: Rapidly alignment of particles as the fluid boundary retreats (shown by the arrow) due to evaporation.