

## **Investigating the Response of Microgel Films Using Ellipsometry**

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### **Abstract**

Microgels are cross-linked polymer particles that respond to external stimuli such as temperature, pH, ionic strength and electric field etc. depending upon the properties of the polymer. The potential to use microgel particles as materials for uptake and release purposes in aqueous solutions has been an area of active research for many years. In this study microgel particles of poly(N-isopropylacrylamide) (PNIPAM) or poly(NIPAM-co-Acrylic acid) (PNIPAM-AAc) have been adsorbed onto a silicon wafer to prepare thermo- and pH responsive thin films. Scanning Electron Microscopy revealed that the films have a monolayer coverage with uniform close-packing. The properties of the microgel films were investigated as a function of the temperature, pH, and ionic strength using ellipsometry. The results show that both the PNIPAM and PNIPAM-AAc microgel layer can respond to temperature change resulting in swelling and de-swelling. The PNIPAM microgel films exhibited a pronounced phase transition at approximately 32 °C similar to that of PNIPAM microgel particles in dispersion. In contrast, ellipsometry results show that microgel films of PNIPAM-AAc, as a function of solution pH, display different behaviour to their analogous dispersions. This difference has been explained in terms of the electrostatic interaction between the negatively charged microgel layer and the positively charged surface. This charge interaction has also been shown to be dependent on electrolyte concentration.