Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

What can cracked polymer do KEXIN JIAO, CHUANHONG ZHOU, PUNIT KOHLI, Department of Chemistry and Biochemistry, Southern Illinois University Carbondale, ANISH POUDEL, TSUCHIN CHU, College of Engineering, Southern Illinois University Carbondale — Buckling, delamination, and cracking are very well known phenomenon observed in most thin films. They were theoretically explained by the existence of mechanical instability due to the residue stress generated when a thin film is deposited on substrates or undergoing environmental stimulus. Buckled structures at micro- or nano-scale have been of great interests and have been used extensively in many applications including particles self-assembling, surface wettability modification, and micro-electronic device fabrication. However, peeling of a layer from a substrate due to delamination or fractures on a thin film due to cracking is mostly taken as an undesirable result. Therefore, strategies are inspired for preventing or removing these often undesired structures. We found that after being heated above its decomposition temperature and then cooled to room temperature, a PDMS thin film showed micro-fibers of 100μm width and up to 1.5 cm in length. By studying the formation mechanism, control of the dimensions and of the growth pattern on a substrate for PDMS micro-fibers were realized. Giving credit to their high flexibility and optical transparency, a PDMS micro-fiber were utilized in high resolution near field imaging achieved by attaching a microlens on the fiber. Interestingly, a surface covered by PDMS micro-fibers will turn from superhydrophobic into superhydrophilic by further heating providing potential applications in surface wettability modification. In future, we will investigate and simulate the growth of PDMS micro-fiber and look for more possible applications.

Kexin Jiao
Department of Chemistry and Biochemistry,
Southern Illinois University Carbondale

Date submitted: 13 Nov 2014 Electronic form version 1.4