Positional Memory of Thermoreversible N-isopropylacrylamide Based Polymer Aggregates on Mica

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Stimuli-responsive polymers are used extensively due to the controlled manner in which one can reversibly alter their physical characteristics. One of the best studied materials is the temperature-sensitive Poly (N-isopropylacrylamide) (PNIPAM), which reversibly phase separates above its lower critical solution temperature (LCST) of ~32° C [1-4]. Here we demonstrate an intriguing and novel property of a PNIPAM based polymer. With a temperature controlled atomic force microscope, we show that polymer aggregates formed on mica above the polymer's LCST and dispersed below it, display positional "memory". That is, the nano-aggregates appear at the same positions during successive cooling/heating cycles preserving a given pattern across the entire image (Fig. 1). This phenomenon can be rationalized from theoretical considerations and has practical implications, i.e. in the development of new nano-micro scale devices.

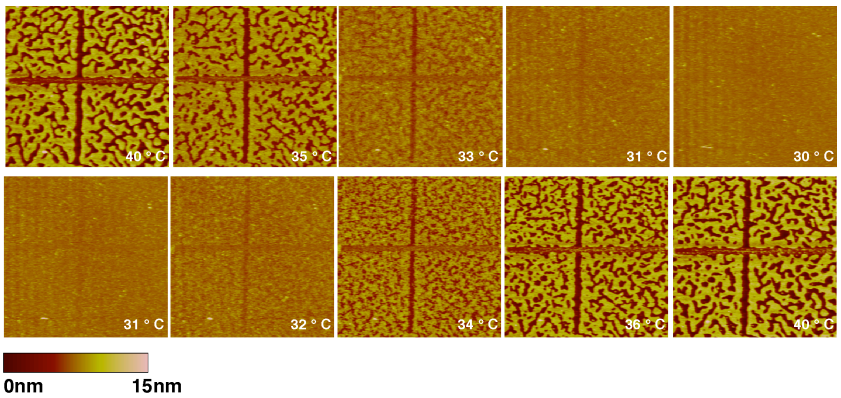

Figure 1. Positional memory of aggregates. A pattern with nano and micro features dissolves upon cooling and reappears upon heating [images are 10×10 microns].

References

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