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Phase Transition of Long Chain Normal Alkanes in Confined Geometry[1]

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Encapsulated normal ($n-$) alkanes can provide well-defined model systems for studying the complex crystallization behaviors of polymers. The size controllable microcapsules with different surface morphology (SEM) have been prepared in the present work, which provide ideal confined geometry for the crystallization research of long chain n-alkanes. Crystallization and phase transition behaviors of long chain n-alkanes (from C18 to C21) in microcapsules were studied with the combination of differential scanning calorimetry (DSC), X-ray diffraction (XRD) as well as Fourier transform infrared spectroscopy (FTIR). As evident from the DSC measurement, a surface freezing monolayer, which is formed in the microcapsules before the bulk crystallization, induces a novel metastable rotator phase (RII) on the cooling process of microencapsulated $n-$nonadecane. We argue that the existence of the surface freezing monolayer provides the ideal nucleation sites, and consequently decreases the nucleating potential barrier of RII phase and turns the transient RII phase to a "long-lived" metastable phase.

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