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Lower Critical Solution Temperature (LCST) and drug conjugation of polyacetal CHATHURANGA DE SILVA, SANJOY SAMANTA, PORAKRIT LEOPHAIRATANA, JEFFREY KOBERSTEIN, Columbia University — There has been an increasing focus in polymer research for materials that can efficiently deliver therapeutics to a pre-identified solid tumor target. Due to their unique properties, stimuli responsive polymers (SRPs) have been of particular interest. One such novel SRP is a polyacetal-based copolymer (PAC). PAC shows a remarkable temperature response (LCST) that is linearly dependent on composition. Here, we discuss the fundamental physical origins of this LCST behavior, exhibited by this polymer. Our results indicate that the observed LCST scales linearly with the number of carbon and oxygen atoms in the polymer repeat units, allowing for precise control over the LCST. We design PAC to include cancer therapeutics in its polymer-backbone, utilizing strategies to modify step-growth polymerization to obtain, for the first time, temperature-responsive main-chain drug conjugates. The temperature response in these main-chain drug conjugates allow for effective delivery of therapeutics to the tumor site, followed by acid-hydrolysis in acidic local tumor environments, to release pristine therapeutics directly at the tumor site. Due to these reasons, we foresee PAC to be in the forefront of soft-matter SRP drug-delivery systems.

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