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## Electromachanical and creep behavior of pullulan hydrogels: Effects of amount of crosslinking agent and electric field strength

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**P**ullulan is one of non-ionic polysaccharides obtained from the fermentation medium of black yeast. Due to its nontoxic, non-mutagenic, non-immunogenic, non-carcinogenic, and odorless characteristics, they have been explored for biomedical applications including tissue engineering, targeted drug/gene delivery, and wound healing. In addition, Pullulan is an interesting material to develop a novel polymeric actuator with improved existing actuation performances. In this work, the pullulan was prepared by using sodium trimetaphosphate (STMP) as a crosslinking agent to form hydrogel. The effects of the amounts of crosslinking agent and electric field strengths on the electromachanical properties were investigated. The storage modulus (G') increased with increasing amount of crosslinking agent. For the electric field strength effect, the storage modulus decreased at low electric field strength. On the other hand, the storage modulus increased at high electric field strength. furthermore, the storage modulus and loss moduli were transformed to the creep compliance through the relaxation spectrum and retardation spectrum, respectively. The creep compliance of pullulan hydrogel decreased at low electric field strength, the creep compliance initially increased at low electric field strength and decreased at high electric field strength, suggesting two competing mechanisms were involved.

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