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Citrate Chemistry and Biology for Biomaterials Design

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Abstract

Leveraging the multifunctional nature of citrate in chemistry and inspired by its important role in biological tissues, a class of highly versatile and functional citrate-based materials (CBBs) has been developed via facile and cost-effective polycondensation. CBBs exhibiting tunable mechanical properties and degradation rates, together with excellent biocompatibility and processability to be successfully applied *in vitro* and *in vivo* for applications ranging from soft to hard tissue regeneration, as well as for nanomedicine designs. We summarize in the review, chemistry considerations for CBBs design to tune polymer properties and to introduce functionality with a focus on the most recent advances, biological functions of citrate in native tissues with the new notion of degradation products as cell modulator highlighted, and the applications of CBBs in wound healing, nanomedicine, orthopedic, cardiovascular, nerve and bladder tissue engineering. Given the expansive evidence for citrate's potential in biology and biomaterial science outlined in this review, it is expected that citrate based materials will continue to play an important role in regenerative engineering.

Keywords: citric acid, elastomer, antimicrobial, osteogenic differentiation, metabolic regulation, regenerative engineering

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