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Smart and advanced biomaterials for regenerative medicine and tissue engineering

Biomateriales inteligentes y avanzados para la medicina regenerativa y la ingeniería de tejidos

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Abstract

There is great interest to develop new materials with properties that resemble those of biological systems such as hierarchical organization, the capacity to grow or self-heal, and the ability to guide complex biological processes. These kinds of materials would open opportunities to engineer tissues with a much-needed higher level of complexity and overcome major obstacles in regenerative medicine. To this end, supramolecular chemistry offers an exciting opportunity to grow such materials from the bottom-up using molecules and processes found in nature. However, the ability to transform molecular and nano-scale design into functional devices with practical utility at the macroscale remains a challenge.

The paper will describe new strategies that integrate supramolecular chemistry with engineering principles to develop practical materials with tuneable and advanced properties such as hierarchical organization, the capacity to grow, tuneable mechanical properties, and specific bioactivity (Inostroza-Brito *et al.* 2015; Aguilar *et al.* 2017; Elsharkawy *et al.* 2018; Hedegaard *et al.* 2018). These materials are being used towards new regenerative therapies of tissues such as enamel, bone, and blood vessels as well as creating more biologically relevant *in vitro* models.

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