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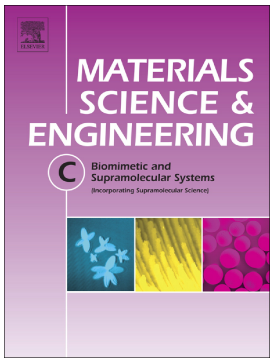

Selected developments and medical applications of organic–inorganic hybrid biomaterials based on functionalized spherosilicates

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Selected developments and medical applications of organic–inorganic hybrid biomaterials based on functionalized spherosilicates

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ABSTRACT

Well-defined and tailor-made spherosilicates and POSS-based (POSS = Polyhedral Oligomeric Silsesquioxanes) (nano)composites with interesting chemical and mechanical properties have applications in the widely-regarded field of innovative biomaterials. They can serve as delivery systems, three-dimensional scaffolds for specific tissue engineering, biomaterials for orthopedic, cardiovascular, and reconstructive surgery, etc. Such organic–inorganic hybrids are much more effective biomaterials than pure polymers, bioglasses, metals, alloys, and ceramics currently used in medical applications and are considered as next-generation systems in innovative medical approaches. This range of applications creates a strong impetus for novel, cheap, and easy-to-scale-up methods for their synthesis. In this review (highlights since 2006), selected biomaterials consisting of various polymeric derivatives such as polymethacrylates, polylactides, polycaprolactones, polyurethanes, etc., which serve as organic side-arms of POSS and can create polymer platforms for precisely localized spherosilicates among organic matrices, are discussed as a new generation of silicon-based biosystems using spherosilicates, promising biomaterials with a particular use in soft- and hard-tissue engineering.