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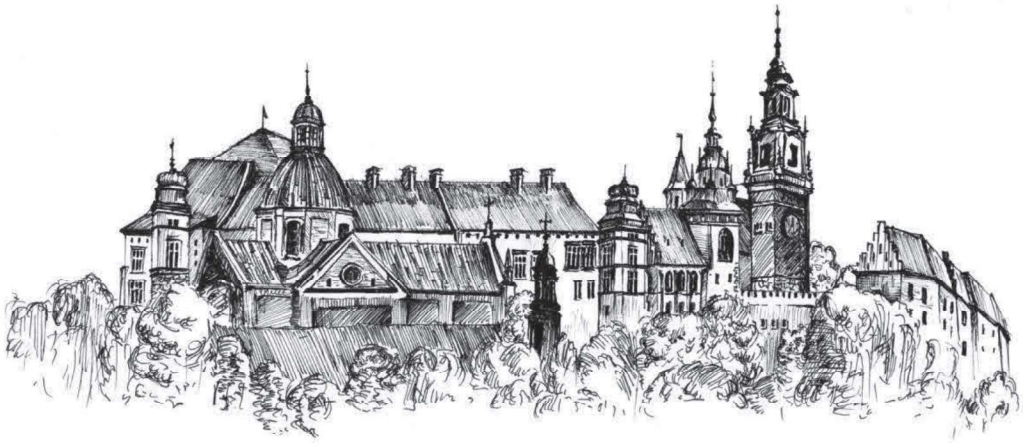

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POSS molecules' use in polymer thermal stabilization: state of the art and future developments

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Polymer was the defining material of the twentieth century whilst, both for the considerable increase in articles published in literature and for the growth of applications over the last fifteen years the defining material platform of the twenty-first century could very well be the hybrid material. The design of an hybrid material is related with the combination of two or more components in a single material to give new and previously unattainable combinations of useful properties [1]. For the preparation of these materials are required building blocks like carbon nanotubes, graphene and polyhedral oligomeric silsesquioxanes (POSSs). The set of knowledge regarding these latter expanded rapidly over a very short period of time as highly efficient synthesis methodologies were developed. Efforts to develop practical applications for discrete POSS frameworks gained a major champion in the early 1990's when Joseph D. Lichtenhan initiated a research program at Edwards Air Force Base (California, USA) to use POSS-containing polymers as precursors to hybrid inorganic/organic materials [2]. The interest observed for these nanomaterials since the nineties, was probably due to an increased focus on mechanistic studies involving POSS frameworks, and the deliberate use of POSS as precursors to more complex Si/O and Si/O/M frameworks. Since the existence of reports consistent with silsesquioxane formation back as far as the 1870s [3], we can consider this new development as a real rebirth of POSS. Today POSSs, due to their thermal and chemical stability, cover with their use various fields, ranging from high-performance materials to flame-resistant materials, novel homogeneous POSS-supported catalyst and applications in proton exchange membranes [4]. POSS molecule has been considered a next generation material in several biological fields, due to its excellent mechanical properties and biodegradability provided by Si–O–Si bonds. Accordingly, POSSs have been used as tissue engineering and biomedical materials and to improve the efficiency and pathway of delivery in drug delivery systems [4].

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