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# Design of Polymeric Nanoparticles for Biomedical Delivery Applications

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## Abstract:

Polymeric nanoparticles-based therapeutics show great promise in the treatment of a wide range of diseases, due to the flexibility in which their structures can be modified, with intricate definition over their compositions, structures and properties. Advances in polymerization chemistries and the application of reactive, efficient and orthogonal chemical modification reactions have enabled the engineering of multifunctional polymeric nanoparticles with precise control over the architectures of the individual polymer components, to direct their assembly and subsequent transformations into nanoparticles of selective overall shapes, sizes, internal morphologies, external surface charges and functionalizations. In addition, incorporation of certain functionalities can modulate the responsiveness of these nanostructures to specific stimuli through the use of remote activation. Furthermore, they can be equipped with smart components to allow their delivery beyond certain biological barriers, such as skin, mucus, blood, extracellular matrix, cellular and subcellular organelles. This tutorial review highlights the importance of well-defined chemistries, with detailed ties to specific biological hurdles and opportunities, in the design of nanostructures for various biomedical delivery applications.

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