

Smart Polymers is Controlled Drug Release

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Abstract: *In recent years, the development of novel drug delivery systems has gained immense attention in the pharmaceutical and biomedical fields. Among them, smart polymers, also referred to as stimuli-responsive polymers, have emerged as a revolutionary class of materials for controlled drug release. Unlike conventional polymers, which provide passive encapsulation and release of drugs, smart polymers are capable of responding to specific external or internal stimuli such as pH, temperature, light, enzymes, redox potential, or magnetic fields. This unique ability enables precise spatial and temporal control of drug release, thereby improving therapeutic efficacy, reducing side effects, and enhancing patient compliance.*

Despite significant progress, several challenges remain in the clinical translation of smart polymer-based drug delivery systems. Issues such as biocompatibility, biodegradability, large-scale production, reproducibility, and regulatory approval must be carefully addressed. Moreover, long-term safety and stability of these materials in biological systems need thorough investigation. Nevertheless, ongoing advances in polymer chemistry, nanotechnology, and biomedical engineering are continuously improving the design and functionality of smart polymers. Integration with emerging fields such as personalized medicine, targeted drug delivery, and nanotheranostics further enhances their potential..

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