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Title: Recent progress on<!–<query id="Q1">Please check the doc head R̈eviewänd correct if necessary.</query>–> DNA block copolymer

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Review

Recent progress on DNA block copolymer

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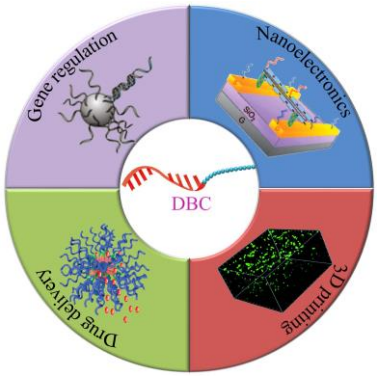
Graphical Abstract



Organic polymers are combined with DNA resulting DNA block copolymers (DBCs) that can simultaneously show the properties of the polymer and DNA. We will discuss some examples of recent developments in the syntheses, structure manipulations, and applications of DBCs.

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ABSTRACT

DNA has gained great attention because of its unique structure, excellent molecular recognition property, and biological functions. When married with versatile synthetic polymers, the DNA conjugated polymer hybrids, known as DNA block copolymers (DBCs), have been launched and well developed for the syntheses of new materials and nanostructures with different functions in the past several decades. Compared to conventional synthetic block copolymers, using DNA as a building block provides several advantages over other polymer candidates, such as molecular recognition, programmable self-assembly, biocompatibility, and sequence-encoded information. In this mini-review, recent developments in this area will be summarized and meaningful breakthroughs will be highlighted. We will discuss representative examples of recent progress in the syntheses, structure manipulations, and applications of DBCs.

1. Introduction

In polymer science, block copolymers have aroused great interest due to their controllable structures and tailorable properties [1-5]. Owing to the existence of varied segments in a polymer chain, block copolymers and their assemblies exhibit unique properties that are different from their homopolymer counterparts [6-10]. It is well-known that the properties and assembly behaviors of block copolymer are highly related to the chemical nature of its component monomers, the length of each block, and the ratio of block length. However, conventional block polymers that consist of multitude of synthetic polymer segments are lack of precise molecular weight and ordered primary structures for each block, impeding the precise control over their assembling behaviors. Alternatively, nature synthesizes a large variety of biopolymers day and night, which usually have precise lengths and well-defined structures. To construct more useful block copolymers, integrating a precise biomacromolecule as one building block is a feasible way to synthesize novel block copolymers, which can bring the hybrid structures with new properties.