Polymerizing Nucleic Acids

Tech ID: 24367 / UC Case 2015-015-0

BACKGROUND

Strategies for the polymerization of (graft-through) and polymerization from (graft-from) proteins and peptides have been used to build macromolecules through sequential addition of monomers to a growing chain, taking advantage of polymerization catalyst proficiency and avoiding kinetically unfavorable conjugations (graft-to) between multiple large macromolecules. However, unlike for other bio-molecules (saccharides, peptides, and proteins), there are no examples of graft-through polymerization and few examples of graft-from polymerization of nucleic acids. Therefore, despite their promise, polymer bioconjugates of true nucleic acid sequences have been mostly limited to those prepared via post-polymerization modification and hence are difficult to reproduce and suffer from incomplete incorporation of the nucleic acid at each position of the polymer.

TECHNOLOGY DESCRIPTION

Chemists from UC San Diego, avoiding shortcomings associated with post-polymerization modification reactions, have developed nucleic acid brush polymers and amphiphilic brush copolymers by direct polymerization via graft-through polymerization of a nucleic acid. This is the first example of a polymer-nucleic acid bioconjugate generated via direct polymerization of an oligonucleotide monomer. In addition, these materials show cooperative hybridization to complementary DNA oligonucleotides. A detailed description of this technology with supplementary data is available (James et al. 2014).

APPLICATIONS

This technology provides an efficient synthetic strategy for the incorporation of nucleic acids into particle and polymer-based materials, with potential applications including the facile preparation of materials for affinity purification of DNA, gene and nucleic acid delivery to cells, and in the development of materials capable of programmed self-assembly.

STATE OF DEVELOPMENT

Working prototype demonstrating cooperative hybridization to complementary DNA oligonucleotides.

RELATED MATERIALS

- James CR, AM Rush, T Insley, L Vukovic, L Adamiak, P Kra, and NC Gianneschi. Poly(oligonucleotide) J. Am. Chem. Soc., 2014, 136 (32), pp 11216–11219. - 07/31/2014

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Published Application	20170327633	11/16/2018	2015-015

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OTHER INFORMATION

CATEGORIZED AS

- **Materials & Chemicals**
  - Biological
  - Polymers
- **Research Tools**
  - Nucleic Acids/DNA/RNA

RELATED CASES

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