



Method for Condensation of Complementary Nucleic Acids

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Technology

Dr. Noel Clark and colleagues at the University of Colorado have developed an innovative method for condensation of nanoDNA (nDNA) duplexes from a solution of complementary and noncomplementary oligos, whereby complementary nucleic acid polymer chains can be efficiently separated from noncomplementary nucleic acid polymer chains. In a solution containing both complementary and noncomplementary nucleic acid, the complementary chains form hydrogen bonded duplexes which segregate into the liquid crystal (LC) domain upon cooling, whereas the non-complementary chains remain single. LC formation separates the solution into LC domains or droplets that contain essentially all of the complementary strands. These droplets can then be separated out.

Within these condensates, end-to-end assembly establishes a high concentration of contacting oligomer chain ends and terminal reactants, thus broadening the possibility for covalent linking of short complementary oligomers into longer ones by, for example, inorganic catalysts. The fact that the LC ordering is found to depend sensitively on complementarity means that LC formation couples complementarity to end contacts among duplexes, and thus to the ability to grow and make more specific the interacting molecules. Therefore, molecules that complementarily aggregate and assemble into larger units that phase separate have an advantage in a chemical race to grow in size and specificity over those that cannot phase separate.

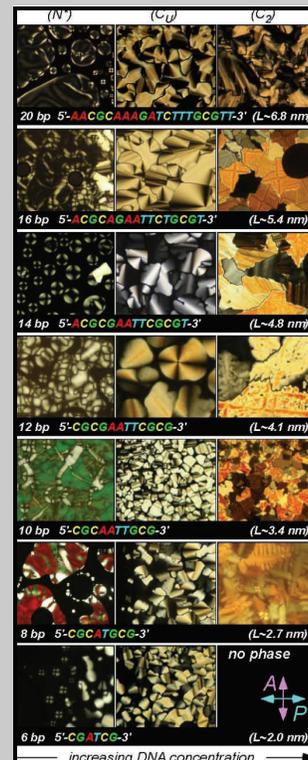


Figure 1: Optical textures of the LC phases of a series of solutions of nDNA of increasing length obtained by depolarized light microscopy.

IP Status:

Patent pending.

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Application

This new methodology, which offers optimized speed, cost, safety, yield, and DNA purity, has broad applications in DNA and RNA separation, identification, sequencing, and in determining the presence or absence of a particular mutation in a DNA or RNA molecule.

Figure 2: Nano-length B DNA complementary duplexes can be idealized as hydrophilic cylinders with hydrophobic ends, with the hexamer illustrated here having a diameter comparable to length.

