NANOHOUR

Wednesday, April 6, 2011 3:00 pm
Beckman Institute - Room 3269

Single-molecule studies on mechanical properties of DNA

Dr. Xueqing Zou, Biophysics

Postdoctoral Research Associate with Professor Klaus Schulten

The genetic information of all living organisms is encoded in DNA sequences. The sequences are read and turned into protein synthesis during a series of processes called gene expression. A key step in gene expression is the strand separation of DNA. This talk will describe the results of recent experimental and computational studies of the mechanics of strand separation. The studies involved on the experimental side the separation of DNA double strands through mechanical forces and on the computational side the simulation of the separation process. The main results is the finding that methylation of DNA, as it arises in epigenetic control of DNA expression, alters strongly the propensity of strand separation under force. While experiment and computation agree on the effects of methylation, computation offers a detailed physical explanation. The experiments employed a new chip technology that permitted the simultaneous force-induced separation of thousands of DNA strands and an optical monitoring of the separation.

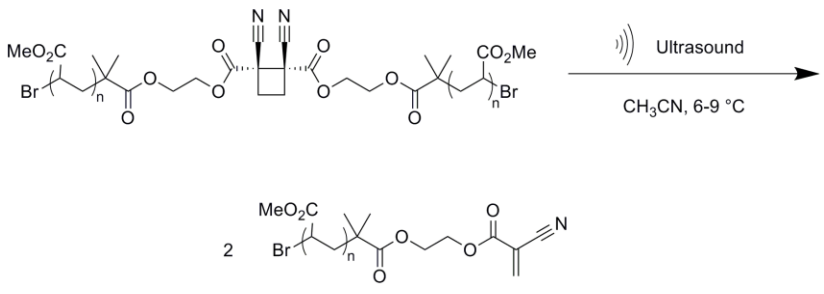
Investigations in the Use of Mechanical Force to Generate Cyanoacrylates for Autonomous Self-Healing

Matthew Kryger, Chemistry

Graduate Student with Professor Jeffrey Moore

Mechanical damage of polymers is often a destructive and irreversible process. However, desirable effects may be achieved by controlling the location of chain cleavage events through careful design and incorporation of mechanically active chemical moieties known as mechanophores. It is possible that mechanophores can be used to generate reactive intermediates that can autopolymerize or cross-link, thus healing mechanically induced damage. Herein we report the generation of reactive cyanoacrylate units from a dicyanocyclobutane mechanophore located near the center of a polymer chain. Because cyanoacrylates (which are used as monomers in the preparation of superglue) autopolymerize, the generated cyanoacrylate-terminated polymers may be useful in self-healing polymers. Sonication studies of polymers with the mechanophore incorporated into the chain center have shown that selective cleavage of the mechanophore occurs. Trapping experiments with an amine-based chromophore support cyanoacrylate formation.

Mechanically Induced Cleavage of Cyclobutane Mechanophore



Coffee and cookies will be served

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