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Insight into the Helix-to-Coil Transition in DNA BOUALEM HAMMOUDA, National Institute of Standards and Technology — Dissolved DNA is known to undergo a helix-to-coil transition when temperature is increased. For a solution of 4% DNA in water, the transition temperature is around 94^{o}C. UV absorption spectroscopy was performed to characterize such a transition. The 260 nm absorption line is a good monitor of the un-stacking of the DNA amine bases. Small-Angle Neutron Scattering was also performed to investigate structural changes that accompany the transition. A characteristic DNA cross section correlation length was found to increase from 9A to 15A and the Porod exponent was found to decrease from close to 4 to around 2 across the transition. The average sugar-sugar inter-distance is larger in the open molecule coil phase. The helix phase is characterized by a cylindrical structure with well-defined interface whereas melted DNA macromolecules behave like Gaussian coils. Jump in the scattered (solvation) intensity was also observed across the transition. A hysteresis cycle was observed upon a subsequent temperature decrease. Once DNA melts, it does not reform the helix phase easily. DNA solvation (interaction of DNA and solvent molecules) has also been investigated. When solvent mixtures (for example water/alcohol mixtures) are used, ideal solvent mixing is observed for the helix phase but a highly non-ideal mixing behavior is observed for the coil phase.

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