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Temperature Dependence of DNA Charge Transport CHRIS WOHLGAMUTH, MARC MCWILLIAMS, JASON SLINKER, UT Dallas — Charge transport (CT) through DNA has been extensively studied, and yet the mechanism of this process is still not yet fully understood. DNA CT has been utilized in sensing proteins and DNA fragments, and it has been postulated that it may assist DNA damage prevention and repair. Besides the benefits of understanding charge transport through this fundamental molecule, further understanding of this process will elucidate the biological implications of DNA CT and advance sensing technology. Therefore, we have investigated the temperature dependence of DNA CT by measuring the electrochemistry of DNA monolayers modified with a redox-active probe. By using multiplexed electrodes on silicon chips, we compare the cyclic and square wave voltammetry of distinct DNA sequences under identical experimental conditions. Accordingly, we compare well matched DNA duplexes to those containing a single base pair mismatch, which has been shown to attenuate CT. The yield of CT is shown to follow Arrhenius behavior, with increased activation energies for mismatches that structurally distort the duplex. These observations suggest that charge transport is thermally activated and highly dependent upon DNA conformation.

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