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Taylor Dispersion in PCR in a microchannel ANUBHAV TRIPATHI, Brown University, ANUJ CHAUHAN, University of Florida — While amplifying DNA strands via polymerease chain reaction (PCR) in a microfluidic device, the sample is subjected to cyclic changes in temperature. We investigate the dispersion of molecules in a microchannel as these undergo a contraction-expansion flow that is driven by temporally changing temperatures. We use method of multiple time scales with regular expansions to obtain the effective dispersivity. Due to the thermal expansion of the carrier fluid, the cyclic temperature variations lead to both axial and lateral velocities. These periodic velocity profiles lead to an increase in axial dispersion. The dispersion coefficient increases as the square of the channel position from the center of the microchannel. Due to the quadratic variation of the dispersion coefficient in the axial direction, the concentration profile is non-Gaussian and a complex function of frequency and magnitude of the temporal oscillations and the dimensions of the microchannel. We derive analytical expressions for dispersion coefficient for cyclic profiles of any shape. We report the results for the mean velocity and the dispersion coefficients for three cases: (i) sinusoidal temperature variations with no reaction; (ii) arbitrary temporal temperature changes without reaction; and (iii) sinusoidal temperature changes with reaction.

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