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First-Passage Time in Entangled Star Polymers Melts JING CAO, JIAN ZHU, ZUOWEI WANG, ALEXEI LIKHTMAN, Univ of Reading — For a single star polymer in a melt of extremely long linear chains, the stress of star polymer relaxes by arm-retraction in which the star arms explore new configurations by withdrawing along their tubes and stretching out towards a new direction. Pearson and Helfand proposed that the arm in the tube can be represented as a harmonic spring with an applied thermal tension such that the arm-end feels an entropic force if it fluctuates away from its equilibrium position. We have investigated the first-passage(FP) time of the destruction of tube segments by representing the arm as a one-dimensional Rouse chain. In contrast, we found that the disengagement of a tube segment is getting faster with more Rouse modes added in, which means the FP problem has to be modelled by a multi-dimensional Kramer's problem. We found a new way of solving the multi-dimensional FP problem by projecting the problem along the most probable trajectory termed "minimal action trajectory" and correcting it by entropy term. In addition, we performed direct and forward-flux simulations of Rouse chains of different lengths. A good agreement between the analytical calculations and simulations was achieved for both discrete and continuous Rouse chains.

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