

Colored noise, folding rates and departure from Kramer's behavior

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Abstract

Recent experiments have shown that, for many proteins, the dependence of folding and unfolding rates on solvent viscosity does not obey the Kramer's theory. Such a departure from the standard Kramer's behavior is often attributed to existence of an internal friction related to the structure of a polypeptide chain. In this paper, we propose an entirely different mechanism leading to violation of the Kramer's theory. Using the generalized Langevin equation with the time-dependent friction and a C_α -Go model, we demonstrate that this effect is caused by the colored Gaussian noise which is characterized by correlation time τ . Surprisingly, the dependence of folding time t_f on τ is non-trivial: the plot t_f vs τ exhibits two minima at low and intermediate values of τ . The appearance of additional one more minimum is a sharp contrast to one dimensional barrier crossing dynamics. We argue that it is a generic signature of entropy of activation in a multidimensional problem.