NEW APPROACHES TO SLOW DYNAMICS OF PROTEIN DOMAINS

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S u m m a r y

Proteins are very familiar objects for biologists and biophysicists. However, from the point of view of the physicist the proteins are mysterious objects, which cannot be compared with any other object in nature. What really set the proteins apart from any other physical system are their motions. The time scale of protein motions covers 15–16 orders of magnitude and extends from 10^{-13} s to minutes or even hours. This is probably the broadest spectrum of motions observable in any other physical system of comparable size. The fastest motions are localized and mostly harmonic. In contrast, the slowest motions are collective (delocalized), strongly inharmonic and dissipative (diffusive). Functioning of the proteins in living cells require subtle balance between the motions with very different time scales. Large scale slow motions are critical for the functioning of numerous enzymes, transport proteins, molecular motors, ion channels and other proteins. In this work we provide systematic analysis of our recent developments in the field of slow protein dynamics based on the concepts of dynamic domains and fuzzy domains.