

Modelling Folding of DNA Origamis

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DNA based nanostructures built on a long ssDNA scaffold, known as DNA origamis, are nowadays the basis of many applications. Those range from the control of single-molecule chemical reactions network to the organization at the nanometer scale of various molecules including proteins and carbon nanotubes. Curiously, many basic questions concerning the mechanisms of formation of the origamis have not been addressed so far. For instance, the robustness of different designs against factors, such as the internal topology, or the influence of the staple pattern, are handled empirically. We have built a model for the folding and melting of DNA origamis that is able to reproduce accurately several thermodynamic quantities measurable from UV absorption experiments. The model can also be used to design a new distribution of crossovers that increases the robustness of the DNA template. The model provides predictions among which a few of them have been already successfully verified. Therefore, in spite of its complexity we now have an algorithm that gives the capability to design and fabricate templates with dedicated properties, a necessary step for technological development.