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Cooperative effects in DNA nanotile attachment
CORINNA MAASS, LANG FENG, TONG WANG, RUOJIE SHA, NADRIAN SEEMAN, PAUL CHAIKIN, NYU — In the context of realising a DNA nanotile system capable of exponentially replicating an information string encoded in a tile pattern with the aid of thermal and UV cycling [1], we encountered the problem of predicting the hybridisation transition temperatures of DNA tile pairs with multiple single strand connectors (sticky ends). For the common single-helix hybridisation transition, sufficiently accurate predictions can be derived from SantaLucia's nearest-neighbour parameter analysis [2]. However, the case of several DNA strands hybridising cooperatively while attached to a rigid object is entropically different and we had to develop a method to factor in the resulting phase space restrictions (cf. a similar approach for DNA-covered colloids [3]). We were able to test our thermodynamic model by fluorescently labelling DNA tile pairs with variable numbers of sticky ends and recording the hybridisation transition using FRET. The data fit our prediction within an acceptable parameter range.

[1] T. Wang et al., *Nature*, 478(7368):225–228, 2011;
[2] J. SantaLucia, *PNAS*, 95(4):1460–1465, 1998
[3] R. Dreyfus et al.; *Phys. Rev. Lett.*, 102(4):048301, 2009.

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Corinna Maass
cm162@nyu.edu
NYU

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