

# Self-Assembly of a Flexible Multi-Joint Ring Motif

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The field of structural DNA nanotechnology has grown enormously in the past decade[1]. It enables us to design a variety of self-assembled structures ranging from 2D to 3D crystalline structures to algorithmically self-assembled aperiodic structures. The invention of DNA origami, which expanded the geometric complexity of DNA nanostructures has accelerated research development in this area.

Making a large planer lattice with no defect is one of remained problems of structural DNA nanotechnology. 2D crystal of DNA tiles or DNA origami motifs can grow up to several hundred micrometers scale but no more because it is difficult to avoid or recover the defects between the clusters.

Here, we propose a flexible DNA origami multi-joint ring motif, which has a potential to self-assemble a large lattice on a 2D substrate surface(Fig.1). We designed the motif as a DNA origami heptagon by a software called caDNAo[2]. The ring motif consists of seven segments made of 12 DNA double-helix bundles. The length of the segment is about 31 nm. The segments are linked by flexible hinges, which allow the motif to take different shapes. Because of this flexibility, it is expected to cover the entire surface without gaps.

The ring motif has an ability to connect with others through the hybridization of DNA strands called "Connector". It is a 5-nt strand extended from the staple strand consists of 1-nt linker (thymine, T) and 4-nt self-complementary sequence such as ACGT. The motif can assemble by the hybridization of the sequences. In total, there are 13 connectors on each segment. Connectors are aligned symmetrically on all the segments, so that the motif can assemble with each other even if the motif is flipped.

The proposed multi-joint ring motif can provide a novel method to create nanostructures of high complexity and high flexibility, which may have a capacity of self-recovery.

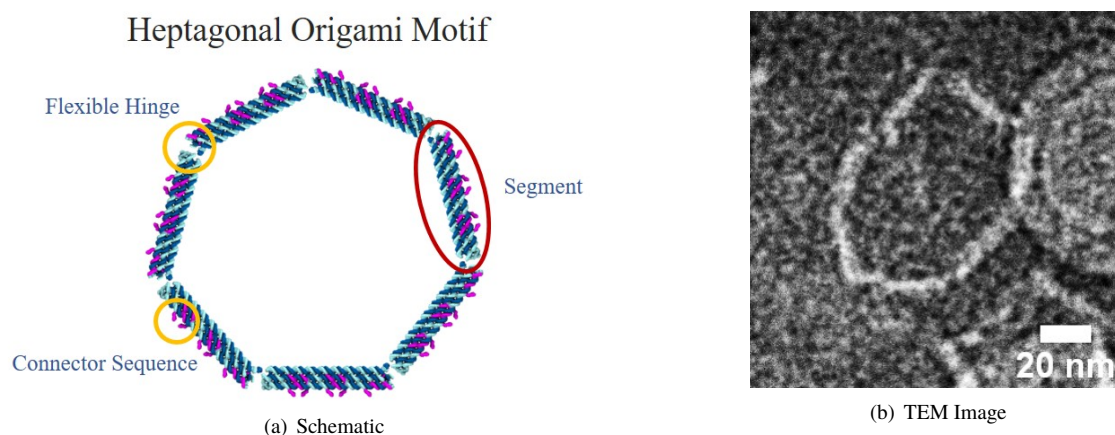


Figure 1: Heptagonal Origami Motif

## References

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