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A DNA catalyst for speeding up a single-molecule DNA nanomotor YUFANG WANG, Y. ZHANG, N. P. ONG, Department of Physics, Princeton University — A drawback of single-molecule DNA-based nanomotors is the slow cycling speed. Previously, a motor based on the cyclic folding and unfolding of a DNA single strand was described by Tan et al. The DNA motor strand M is a 17-base sequence that folds into a chair-type quadruplex structure in the presence of potassium ions. A fuel strand A complementary to M is added. Hybridization of M with A unfolds the chair structure. Next, addition of a restoration fuel strand B de-hybridizes the double strand and restores M to its chair configuration, completing the cycle. We have found that the bottleneck for this cycle is the tendency for B to also fold into the chair structure. By introducing a short catalyst strand C which inhibits this premature folding, we have achieved a doubling of the speed of the motor. The catalyst shows robust behavior over several cycles.

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