MEASURING BIOPHYSICAL CONSTANTS WITH AN NSET TORQUE WRENCH.
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Aptamer beacon systems have recently become popular due to their high target selectivity, functionalizability, and wide-range of applications. In the biomedical field, they are utilizable as detection assays, binding agents, molecular delivery systems, etc. Here we report a highly sensitive (Kd=76nM) hairpin aptamer-gold nanoparticle conjugate for the optical detection of ATP. Utilizing NSET between the nanoparticle and a fluorescent dye, this aptamer beacon system is able to detect and measure ATP concentration based upon the conformational change of the hairpin aptamer when ATP-bound. In the ATP-unbound state, a fluorescent-quenching (“off” state) is observed, whereas a fluorescent “on” state is observed in the presence of ATP. Additionally, NSET’s low optical detection limits make vital kinetic information and binding-site data obtainable. This aptamer beacon system shows promise in biomedical monitoring systems and, moreover, it achieves a sought-after feat in nanotechnology by producing a wealth of information from minimal material and experimentation.