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DNA Photo Lithography with Cinnamate-based Photo-Bio-Nano-Glue LANG FENG, MINFENG LI, JOY ROMULUS, RUOJIE SHA, JOHN ROYER, KUN-TA WU, QIN XU, NADRIAN SEEMAN, MARCUS WECK, PAUL CHAIKIN, New York University — We present a technique to make patterned functional surfaces, using a cinnamate photo cross-linker and photolithography. We have designed and modified a complementary set of single DNA strands to incorporate a pair of opposing cinnamate molecules. On exposure to 360nm UV, the cinnamate makes a highly specific covalent bond permanently linking only the complementary strands containing the cinnamates. We have studied this specific and efficient crosslinking with cinnamate-containing DNA in solution and on particles. UV addressability allows us to pattern surfaces functionally. The entire surface is coated with a DNA sequence A incorporating cinnamate. DNA strands A'B with one end containing a complementary cinnamated sequence A' attached to another sequence B, are then hybridized to the surface. UV photolithography is used to bind the A'B strand in a specific pattern. The system is heated and the unbound DNA is washed away. The pattern is then observed by thermo-reversibly hybridizing either fluorescently dyed B' strands complementary to B, or colloids coated with B' strands. Our techniques can be used to reversibly and/or permanently bind, via DNA linkers, an assortment of molecules, proteins and nanostructures. Potential applications range from advanced self-assembly, such as templated self-replication schemes recently reported [1], to designed physical and chemical patterns, to high-resolution multi-functional DNA surfaces for genetic detection or DNA computing. [1] Tong, W et al, Nature, 478, 225-228(2011)

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