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(54) **PROBE FOR NUCLEIC ACID SEQUENCING AND METHODS OF USE**

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(57) **ABSTRACT**

A nanoprobe for sequencing of nucleic acid molecules is provided, as well as methods for using the nanoprobe. In particular examples, the probe includes a polymerizing agent and one or more molecular linkers that carry a chemical moiety capable of reversibly binding to the template strand of a nucleic acid molecule, without being detached from the linker, by specifically binding with a complementary nucleotide in the target nucleic acid molecule. The reversible binding of the chemical moiety on the linker with a complementary nucleotide in the target nucleic acid molecule is indicated by emission of a characteristic signal that indicates pairing of the chemical moiety on the linker with its complementary nucleotide. An example of such a chemical moiety is a non-hydrolyzable nucleotide analog. In particular examples, the polymerizing agent and the chemical moiety are associated with a tag, such as a donor fluorophore and acceptor fluorophore characteristic of the particular type of chemical moiety.