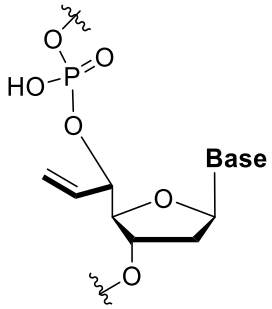
CLAIMS

1. A solid support comprising a plurality of double-stranded polynucleotides, each double-stranded polynucleotide comprises a first strand and a second strand immobilized on the solid support, each first strand comprises a first cleavage site capable of undergoing chemical cleavage by a transition metal complex; wherein the transition metal complex is a palladium complex or a nickel complex, wherein the first strand and second strand are immobilized to the solid support at their 5′ ends, and wherein the first cleavage site comprises the modified nucleoside or nucleotide having a structure of Formula (II´):



(II′)

wherein Base is adenine, guanine, cytosine, thymine, or uracil, or a derivative thereof.

2. The solid support of claim 1, wherein each first strand comprises a first extension primer immobilized to the solid support.

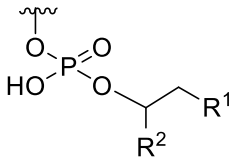
3. The solid support of claim 2, wherein the first extension primer comprises the first cleavage site.

4. The solid support of claim 2 or 3, wherein the first extension primer comprises a P5 sequence having a sequence of SEQ ID NO. 1 or 3.

5. The solid support of any one of claims 1 to 4, wherein the first cleavage site comprises a modified nucleoside or nucleotide that is capable of undergoing chemical cleavage by the palladium complex or the nickel complex.

6. The solid support of claim 5, wherein the modified nucleoside or nucleotide comprises an allyl group.

7. A solid support comprising a 3′ blocking moiety comprises a phosphate moiety having a structure of Formula (I):



(I)

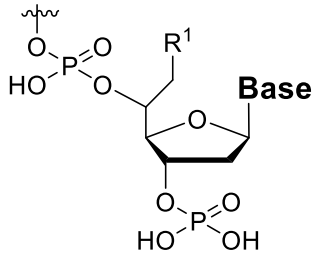
wherein

R^1 is $–NH_2$, –OH, $–NHC(O)OR^a$ or $–OCH_2OSi(R^b)_3$;

R^a is C_{1-4}alkyl, tert-butyl, allyl, benzyl group, or 9-fluorenylmethyl;

each R^b is independently selected from the group consisting of C_{1-4} alkyl and phenyl; and R^2 is H, C_{1-4} alkyl, tetrahydrofuran, or a nucleotide;

or of Formula (V):



(V)

wherein R^1 is $–NH_2$, –OH, $–NHC(O)OR^a$ or $–OCH_2OSi(R^b)_3$;

R^a is C_{1-4}alkyl, tert-butyl, allyl, benzyl group, or 9-fluorenylmethyl;

each R^b is independently selected from the group consisting of C_{1-4} alkyl and phenyl; and

Base is adenine, guanine, cytosine, thymine, or uracil, or a derivative thereof, wherein the solid support is generated by cleaving the first cleavage site of the solid support of any one of claims 1 to 6.

8. The solid support of claim 7, wherein tetrahydrofuran in R^2 in Formula (I) substituted.

9. The solid support of claim 7, wherein Base in Formula (V) is protected.

10. The solid support of any one of claims 7 to 9, comprising a second strand according to any one of claims 1 to 9 immobilized thereon wherein each second strand comprises a second cleavage site.

11. The solid support of claim 10, wherein the second strand comprises a second extension primer immobilized to the solid support.

12. The solid support of claim 11, wherein the second extension primer comprises the second cleavage site.

13. The solid support of any one of claims 10 to 12, wherein the second cleavage site is not capable of undergoing chemical cleavage by the palladium complex or the nickel complex.

14. The solid support of any one of claims 10 to 12, wherein the second cleavage site had been cleaved by a chemical cleavage.

15. The solid support of any one of claims 10 to 12, the second cleavage site comprises a diol linker or an azobenzene linker.

16. A method of linearizing a plurality of double-stranded polynucleotides which are immobilized on a solid support, comprising:

providing the solid support of any one of claims 1-6

contacting the double-stranded polynucleotides with an aqueous solution of the transition metal complex, thereby cleaving one or more first strands at the first cleavage site, and generating one or more cleaved first nucleic acids and cleaved immobilized first strands; and removing the cleaved first nucleic acids from the solid support.

17. The method of claim 16, wherein the transition metal complex is a palladium (0) or a nickel (0) complex.

18. The method of claim 17, wherein the palladium (0) complex is $Pd(THP)_2$, $Pd(THP)_4$, $Pd(THM)_4$, or combinations thereof.

19. The method of claim 17 or 18, wherein the palladium (0) complex is generated in situ.

20. The method of claim 17, wherein the nickel (0) complex is generated in situ from a nickel (II) compound.

21. The solid support of any one of claims 10 to 13 and 15, wherein the second cleavage site is cleaved by a method selected from the group consisting of chemical cleavage, photo cleavage, enzymatic cleavage, and a combination thereof.