

WHAT IS CLAIMED IS:

- 1 1. An Sso7 polymerase conjugate protein comprising an Sso7 domain
2 linked to a polymerase; wherein:
3 an amino acid of the Sso7 domain corresponding to K28 of SEQ ID
4 NO:2 is not lysine (K); and/or
5 an amino acid of the Sso7 domain corresponding to R43 of SEQ ID
6 NO:2 is not arginine (R),
7 wherein the conjugate protein has a decreased non-specific amplification
8 activity compared to an otherwise identical control conjugate protein in which the amino acid
9 of the Sso7 domain corresponding to K28 of SEQ ID NO:2 is lysine (K) and the amino acid
10 of the Sso7 domain corresponding to R43 of SEQ ID NO:2 is arginine (R).
- 1 2. The Sso7 polymerase conjugate protein of claim 1, wherein the non-
2 specific amplification activity of the Sso7 polymerase conjugate protein is reduced by at least
3 10% compared to non-specific amplification activity of the control conjugate protein.
- 1 3. The Sso7 polymerase conjugate protein of claim 1, wherein the amino
2 acid of the Sso7 domain corresponding to K28 of SEQ ID NO:2 is not lysine (K).
- 1 4. The Sso7 polymerase conjugate protein of claim 3, wherein the amino
2 acid of the Sso7 domain corresponding to K28 of SEQ ID NO:2 is selected from the group
3 consisting of serine (S), threonine (T), cytosine (C), proline (P), aspartic acid (D), glutamic
4 acid (E), asparagine (N), glutamine (Q), alanine (A), phenylalanine (F), glycine (G), histidine
5 (H), isoleucine (I), leucine (L), methionine (M), arginine (R), valine (V), tryptophan (W), and
6 tyrosine (Y).
- 1 5. The Sso7 polymerase conjugate protein of claim 1, wherein the amino
2 acid of the Sso7 domain corresponding to R43 of SEQ ID NO:2 is not arginine (R).
- 1 6. The Sso7 polymerase conjugate protein of claim 5, wherein the amino
2 acid of the Sso7 domain corresponding to R43 of SEQ ID NO:2 is selected from the group
3 consisting of alanine (A), cytosine (C), aspartic acid (D), glutamic acid (E), phenylalanine
4 (F), glycine (G), histidine (H), isoleucine (I), lysine (K), leucine (L), methionine (M),
5 asparagine (N), glutamine (Q), serine (S), threonine (T), valine (V), tryptophan (W), tyrosine
6 (Y), and proline (P).

- 1 7. The Sso7 polymerase conjugate protein of claim 1, wherein the
2 polymerase substantially lacks a 3'-5' exonuclease activity.
- 1 8. The Sso7 polymerase conjugate protein of claim 1, wherein the Sso7
2 domain is substantially (e.g., at least 60, 75, 80, 85, 90, or 95%) identical to the first 58 or 60
3 amino acids of SEQ ID NO:2 or to the full-length of SEQ ID NO:2.
- 1 9. The Sso7 polymerase conjugate protein of claim 1, wherein the Sso7
2 domain is at least 90% identical to SEQ ID NO:2.
- 1 10. The Sso7 polymerase conjugate protein of claim 1, wherein the
2 polymerase is substantially (e.g., at least 60, 75, 80, 85, 90, or 95%) identical to SEQ ID
3 NO:33 or SEQ ID NO:61.
- 1 11. The Sso7 polymerase conjugate protein of claim 10, wherein the
2 polymerase comprises SEQ ID NO: 33 or SEQ ID NO:61.
- 1 12. The Sso7 polymerase conjugate protein of claim 1, wherein the
2 polymerase domain has thermally stable polymerase activity.
- 1 13. The Sso7 polymerase conjugate protein of claim 12, wherein the
2 polymerase domain is a family A polymerase domain.
- 1 14. The Sso7 polymerase conjugate protein of claim 13, wherein the
2 polymerase domain is a Δ Taq polymerase domain.
- 1 15. The Sso7 polymerase conjugate protein of claim 12, wherein the
2 polymerase domain is a family B polymerase domain.
- 1 16. The Sso7 polymerase conjugate protein of claim 15, wherein the
2 polymerase domain is from *Pyrococcus*.
- 1 17. A reaction mixture comprising the Sso7 polymerase conjugate protein
2 of any of claims 1-16.
- 1 18. The reaction mixture of claim 17, further comprising at least one of or
2 more oligonucleotide primers, one or more detectably-labeled oligonucleotide probe, a
3 buffer, nucleoside triphosphates, a salt, a DNA binding dye, or a stabilizer.

- 1 19. A kit comprising the Sso7 polymerase conjugate protein of any of
2 claims 1-16.
- 1 20. The kit of claim 19, further comprising in the same or a different
2 container that contains the conjugate protein, at least one of one or more oligonucleotide
3 primers, one or more detectably-labeled oligonucleotide probe, a buffer, nucleoside
4 triphosphates, a salt, a DNA binding dye, or a stabilizer.
- 1 21. A method of amplifying a target nucleic acid in a sample, the method
2 comprising incubating the target nucleic acid in a reaction mixture comprising:
3 a. at least one primer; and
4 b. the Sso7 polymerase conjugate protein of any of claims 1-16,
5 under conditions to allow for amplification of the target nucleic acid with the
6 primer, thereby amplifying the target nucleic acid.
- 1 22. The method of claim 21, wherein the method comprises a polymerase
2 chain reaction (PCR).
- 1 23. A nucleic acid comprising a polynucleotide encoding the Sso7
2 polymerase conjugate protein of any of claims 1-16.
- 1 24. A cell comprising a recombinant expression cassette, the expression
2 cassette comprising a promoter operably linked to the polynucleotide of claim 23.

What is claimed is:

1. An Sso7 polymerase conjugate protein comprising an Sso7 domain linked to a polymerase; wherein the Sso7 domain is at least 75% identical to SEQ ID NO:2;

the amino acid of the Sso7 domain corresponding to K28 of SEQ ID NO:2 is not lysine (K); and

wherein the conjugate protein has a decreased non-specific amplification activity compared to an otherwise identical control conjugate protein in which the amino acid of the Sso7 domain corresponding to K28 of SEQ ID NO:2 is lysine (K).

2. The Sso7 polymerase conjugate protein of claim 1, wherein the non-specific amplification activity of the Sso7 polymerase conjugate protein is reduced by at least 10% compared to non-specific amplification activity of the control conjugate protein.

3. The Sso7 polymerase conjugate protein of claim 1, wherein the amino acid of the Sso7 domain corresponding to K28 of SEQ ID NO:2 is selected from the group consisting of serine (S), threonine (T), cysteine (C), proline (P), aspartic acid (D), glutamic acid (E), asparagine (N), and glutamine (Q).

4. The Sso7 polymerase conjugate protein of claim 1, wherein the amino acid of the Sso7 domain corresponding to K28 of SEQ ID NO:2 is selected from the group consisting of alanine (A), phenylalanine (F), glycine (G), histidine (H), isoleucine (I), leucine (L), valine (V), tryptophan (W), and tyrosine (Y).

5. The Sso7 polymerase conjugate protein of claim 1, wherein the polymerase substantially lacks a 3'-5' exonuclease activity.

6. The Sso7 polymerase conjugate protein of claim 1, wherein the Sso7 domain is at least 90% identical to SEQ ID NO:2.

7. The Sso7 polymerase conjugate protein of claim 1, wherein the polymerase is at least 60% identical to SEQ ID NO:33 or SEQ ID NO:61.

8. The Sso7 polymerase conjugate protein of claim 7, wherein the polymerase comprises SEQ ID NO: 33 or SEQ ID NO:61.

9. The Sso7 polymerase conjugate protein of claim 1, wherein the polymerase domain has thermally stable polymerase activity.

10. The Sso7 polymerase conjugate protein of claim 9, wherein the polymerase domain is a family A polymerase domain.

11. The Sso7 polymerase conjugate protein of claim 10, wherein the polymerase domain is a Δ Taq polymerase domain.

12. The Sso7 polymerase conjugate protein of claim 9, wherein the polymerase domain is a family B polymerase domain.

13. The Sso7 polymerase conjugate protein of claim 12, wherein the polymerase domain is from *Pyrococcus*.

14. A reaction mixture comprising the Sso7 polymerase conjugate protein of claim 1.

15. The reaction mixture of claim 14, further comprising at least one of or more oligonucleotide primers, one or more detectably-labeled oligonucleotide probe, a buffer, nucleoside triphosphates, a salt, a DNA binding dye, or a stabilizer.

16. A kit comprising the Sso7 polymerase conjugate protein of claim 1.

17. The kit of claim 16, further comprising in the same or a different container that contains the conjugate protein, at least one of one or more oligonucleotide primers, one or more detectably-labeled oligonucleotide probe, a buffer, nucleoside triphosphates, a salt, a DNA binding dye, or a stabilizer.