

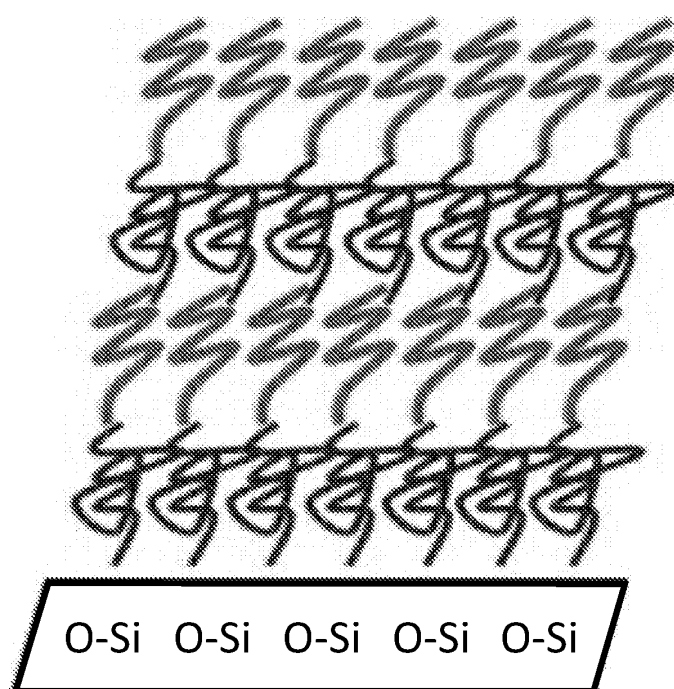


FIG. 1

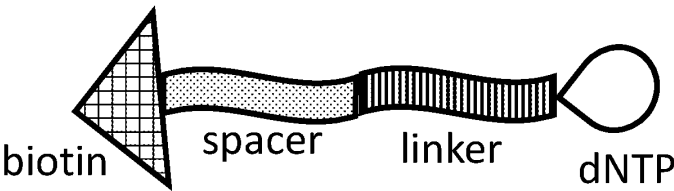


FIG. 2A

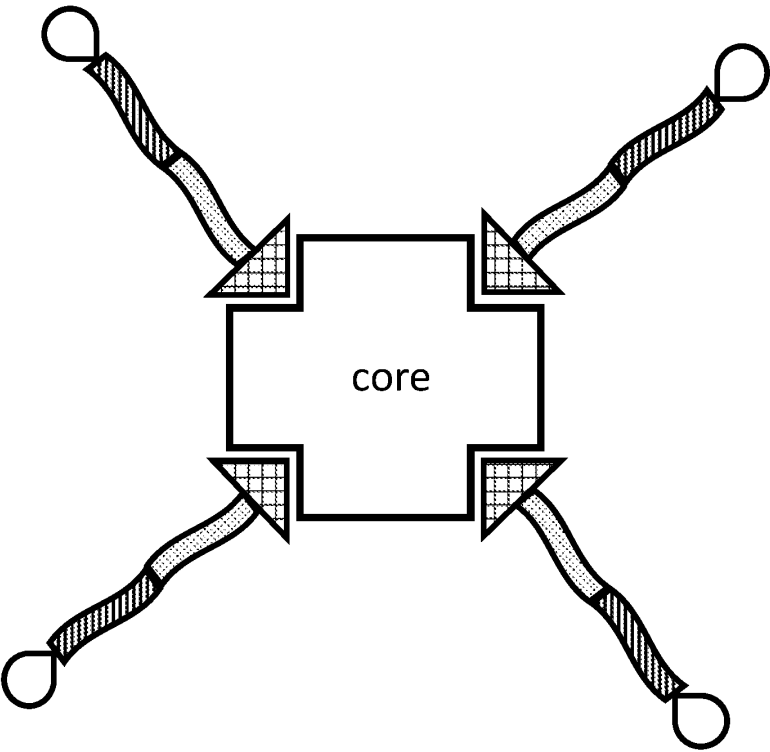
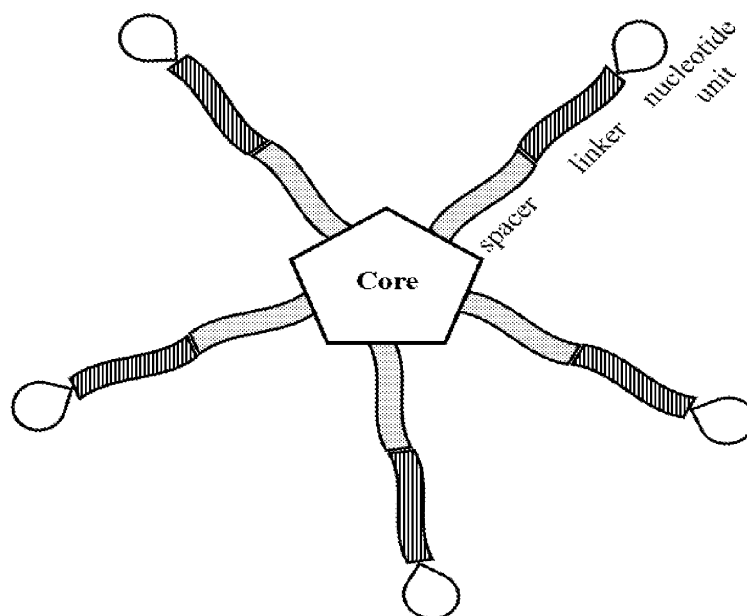
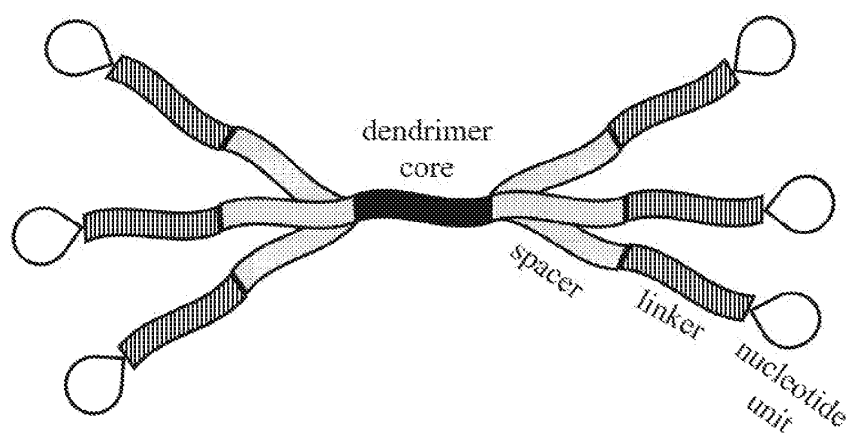


FIG. 2B

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**FIG. 2C****FIG. 2D**

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Wild type DNA polymerase from Candidatus altiarthaeales archaeon (SEQ ID NO:1)

MKKTLLDADYITREEKAVVRLFYKTEEGREIQEVADFRPYMYVLPEEHDLLKKLQREIKEL
KNITNVEIKRMIEGDREVEVLKVMVNQPRDVPNLRGLIKELEGCKEVREAHIPFAERYLI
DSGLIPMQDCENFDLRIAAFDMEVYNPRGEPKAERDPIIIISYADNRGLRRVWYKTVEN
LNLDYMEVLKDEREIIIRRFIDTIREREIDIIVTYNGDNFDFPYLKERAEKHRIPVSLGVD
GSPLRLERRGMNLGARVTGRPHIDMYPVCRQIFNLSRYTLEDVYLEITGREKKDIRVGEM
AGIWDNPEKEKFKELIEYAMSDAESTLEIAITLLPLHYEISRITRELIYQSSRAGSGQRV
ESLLIKKAFEKSILVPNRPSDRVNERQRKTYIGAYVVEPKRGIHDNILLDFRSLYPSI
IISHNIDPSTIDCECCPEDSYRSPTGHYFCKKKRGLIPETLNELVQRRIEVKKGLKNEKN
PERRRFLDVKQQALKLLANSYGYFGFPRARWYCRECAESITALGRKYILHTIDIVPKFG
FDVIYGDTSVYLIKPNITDRERVMKNAEHFLDKINSELPEAMELEFEGFYPRGIFITKK
RYALIDERGKLIVKGLETKRWDWANIADTQEKVLDALLKDKNPEKAASIVKDVIRNIKT
GKIPLKDLAINTQITRGMAYKTEGPHIVAACKAMKRGLEFKQGNIVTYVVTKKGKSISD
KARVIDFVEEGDYDPDYYINNQVLPVLRILEALGYSEDELKGLGKQMKLGGF

FIG. 3**Mutant DNA polymerase from Candidatus altiarthaeales archaeon (SEQ ID NO:2)**

MMKKTLLDADYITREEKAVVRLFYKTEEGREIQEVADFRPYMYVLPEEHDLLKKLQREIKELKNI
TNVEIKRMIEGDREVEVLKVMVNQPRDVPNLRGLIKELEGCKEVREAHIPFAERYLIDSGLI
PMQDCENFDLRIAAF**AM**AVYNPRGEPKAERDPIIIISYADNRGLRRVWYKTVENLNLDYMEVLK
DEREIIIRRFIDTIREREIDIIVTYNGDNFDFPYLKERAEKHRIPVSLGVDGSPLRLERRGMNLGA
RVTGRPHIDMYPVCRQIFNLSRYTLEDVYLEITGREKKDIRVGEMAGIWDNPEKEKFKELIEYA
MSDAESTLEIAITLLPLHYEISRITRELIYQSSRAGSGQRVESLLIKKAFEKSILVPNRPSDRV
VNERQRKTYIGAYVVEPKRGIHDNILLDFR**SAGS**IIISHNIDPSTIDCECCPEDSYRSPTGH
YFCKKKRGLIPETLNELVQRRIEVKKGLKNEKNPERRRFLDVKQQ**SL**KLLANSYGYFGFPRAR
WY**LE**CAESITALGRKY**HL**HTIDIVPKFGFDVIYGDTSVYLIKPNITDRERVMKNAEHFLDKI
NSELPEAMELEFEGFYPRGIFITKKRYALIDERGKLIVKGLETKRWDWANIADTQEKVLDALL
KDKNPEKAASIVKDVIRNIKTGKIPLKDLAINTQITRGMAYKTEGPHIVAACKAMKRGLEFKQ
GNIVTYVVTKKGKSISDKARVIDFVEEGDYDPDYYINNQVLPVLRILEALGYSEDELKGLGKQ
MKLGGF

FIG. 4

Mutant DNA polymerase from Candidatus altiarthaeales archaeon (SEQ ID NO:3)

MMKKTLLDADYITREEKAVVRLFYKTEEGREIQEVADFRPYMYVLPEEHDLLKKLQREIKELKNI
TNVEIKRMIEGDREVEVLKVMVNQPRDVPNLRGLIKELEGCKEVREAHIPFAERYLIDSGLIIPM
QDCENFDLRIAAF**AM**AVYNPRGEPKAERDPIIIISYADNRGLRRVWTYKTVENLNLDYMEVLKD
EREIIRRFIDTIREREIDIIVTYNGDNFDFPYLKERAEKHRIPVSLGVDGSPRLRERRGMNLGA
RVTGRPHIDMPVCRQIFNLSRYTLEDVYLEITGREKKDIRVGEMAGIWDNPEKEKFKELIEYA
MSDAESTLEIAITLLPLHYEISRITRELIYQSSRAGSGQRVESLLIKKAFEKSILVPNRPSDRV
VNERQRKTYIGAYVVEPKRGIHDNILLDFDRS**SAGS**IIISHNIDPSTIDCECCPEDSYRSPTGH
YFCKKKRGLIPETLNELVQRRIEVKKGLKNEKNPERRRFLDVKQ**QSL**KLLANSMYGYFGFPRAR
WY**CLE**CAESITALGRKY**HL**HTIDIVPKFGFDVIYGDTSVYLIKPNITDRERVMK**DAE**HFLDKI
NSELPEAMELEFEGFYPRGIFITKKRYALIDERGKLIVKGLETKRRDWANIAKDTQEKVLDALL
KDKNPEKAASIVKDVIRNIKTGKIPLKDLAINTQITRGMAEYKTEGPHIVAACKAMKRGLEFKQ
GNIVTYVVTKKGKSISDKARVIDFVEEGDYDPDYINNQVLPSVLRILEALGYSEDELKGLGKQ
MKLGGF

FIG. 5

Mutant DNA polymerase from Candidatus altiarthaeales archaeon (SEQ ID NO:4)

MMKKTLLDADYITREEKAVVRLFYKTEEGREIQEVADFRPYMYVLPEEHDLLKKLQREIKELKNI
TNVEIKRMIEGDREVEVLKVMVNQPRDVPNLRGLIKELEGCKEVREAHIPFAERYLIDSGLIIPM
QDCENFDLRIAAF**AM**AVYNPRGEPKAERDPIIIISYADNRGLRRVWTYKTVENLNLDYMEVLKD
EREIIRRFIDTIREREIDIIVTYNGDNFDFPYLKERAEKHRIPVSLGVDGSPRLRERRGMNLGA
RVTGRPHIDMPVCRQIFNLSRYTLEDVYLEITGREKKDIRVGEMAGIWDNPEKEKFKELIEYA
MSDAESTLEIAITLLPLHYEISRITRELIYQSSRAGSGQRVESLLIKKAFEKSILVPNRPSDRV
VNERQRKTYIGAYVVEPKRGIHDNILLDFDRS**FAGS**IIISHNIDPSTIDCECCPEDSYRSPTGH
YFCKKKRGLIPETLNELVQRRIEVKKGLKNEKNPERRRFLDVKQ**QSL**KLLANSMYGYFGFPRAR
WY**CLE**CAESITALGRKY**HL**HTIDIVPKFGFDVIYGDTSVYLIKPNITDRERVMK**DAE**HFLDKI
NSELPEAMELEFEGFYPRGIFITKKRYALIDERGKLIVKGLETKRRDWANIAKDTQEKVLDALL
KDKNPEKAASIVKDVIRNIKTGKIPLKDLAINTQITRGMAEYKTEGPHIVAACKAMKRGLEFKQ
GNIVTYVVTKKGKSISDKARVIDFVEEGDYDPDYINNQVLPSVLRILEALGYSEDELKGLGKQ
MKLGGF

FIG. 6

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Mutant DNA polymerase from Candidatus altiarchaeales archaeon (SEQ ID NO:5)

MMKKTLLDADYITREEKAVVRLFYKTEEGREIQEVADFRPYMYVLPEEHDLLKKLQREIKELKNI
TNVEIKRMIEGDREVEVLKVMVNQPRDVPNLRGLIKELEGCKEVREAHIPFAERYLIDSGLIPI
QDCENFDLRIAAF**AM**AVYNPRGEPKAERDPIIIISYADNRGLRRVWTYKTVENLNLDYMEVLKD
EREIIRRFIDTIREREIDIIVTYNGDNFDFPYLKERAEKHRIPVSLGVDGSPRLRERRGMNLGA
RVTGRPHIDMYPVCRQIFNLSRYTLEDVYLEITGREKKDIRVGEMAGIWDNPEKEKFKELIEYA
MSDAESTLEIAITLLPLHYEISRITRELIYQSSRAGSGQRVESLLIKKAFEKSILVPNRPSDRV
VNERQRKTYIGAYVVEPKRGIHDNILLFDFRS**YAGS**IIISHNIDPSTIDCECCPEDSYRSPTGH
YFCKKKRGLIPETLNELVQRRIEVKKGLKNEKNPERRRFLDVKQ**QSL**KLLANSMYGYFGFPRAR
WY**CLE**CAESITALGRKY**HL**HTIDIVPKFGFDVIYGDTSVYLIKPNITDRERVMK**DAE**HFLDKI
NSELPEAMELEFEGFYPRGIFITKKRYALIDERGKLIVKGLETKRRDWANIAKDTQEKVLDALL
KDKNPEKAASIVKDVIRNIKTGKIPLKDLAINTQITRGMAEYKTEGPHIVAACKAMKRGLEFKQ
GNIVTYVVTKKGKSISDKARVIDFVEEGDYDPDYINNQVLPSVLRILEALGYSEDELKGLGKQ
MKLGGF

FIG. 7

9°N polymerase (SEQ ID NO:6)

MILDTDYITENGKPVIRVFKKENGEFKIEYDRTFEPYFYALLKDDSAIEDVKKVTAKRHG
TVVKVKRAEKVQKKFLGRPIEVWKLYFNHPQDVP AIRDRIRAHPAVVDIYEYDIPFAKRY
LIDKGLIP AEGDEELTMLAFDIETLYHEGEEFGTGPILMISYADGSEARVITWKKIDL PY
VDV VSTEKEMIKRFLRVVREKDPDVLITYNGDNFDFAYLKKRCEELGIKFTLGRDGSEPK
IQRMGDRFAVEVKGRIHFDLYPVIRRTINLPTYTLEAVYEAVFGKPKEKVYAE EIAQAW E
SGEGLERVARYSMEDAKVTYELGREFFPMEAQLSRLIGQSLWDVSRSTGNLVEWFLLRK
AYKRNELAPNKPDERELARRRGYAGGYVKEPERGLWDNIVYLDFRSLYPSIIITHNVSP
DTLNREGCKEYDVAPEVGHKFCKDFPGFIPSL LGDLLEERQKIKRKM KATVDPLEKKLLD
YRQRAIKILANSFYGYGYAKARWYCKECAESVTAWGREYIEMVIRELEEKFGFKVLYAD
TDGLHATIPGADAETVKKKAKEFLKYINPKLPGLLELEYEGFYVRGFFVTKKKYAVIDEE
GKITTRGLEIVRRDWSEIAKETQARVLEAILKHGDVEEAVRIVKEVTEKLSKYEVPPEKL
VIHEQITRDLRDYKATGPHVAVAKRLAARGVKIRPGTVISYIVLKSGRIGDRAIPADEF
DPTKHRYDAEYYIENQVLP AVERILKAFGYRKEDLRYQKTKQVGLGAWLKVKGKK

FIG. 8**9°N polymerase UniProtKB - Q56366 (DPOL_THES9) (SEQ ID NO:7)**

MILDTDYITENGKPVIRVFKKENGEFKIEYDRTFEPYFYALLKDDSAIEDVKKVTAKRHG
TVVKVKRAEKVQKKFLGRPIEVWKLYFNHPQDVP AIRDRIRAHPAVVDIYEYDIPFAKRY
LIDKGLIPMEGDEELTMLAFDIETLYHEGEEFGTGPILMISYADGSEARVITWKKIDL PY
VDV VSTEKEMIKRFLRVVREKDPDVLITYNGDNFDFAYLKKRCEELGIKFTLGRDGSEPK
IQRMGDRFAVEVKGRIHFDLYPVIRRTINLPTYTLEAVYEAVFGKPKEKVYAE EIAQAW E
SGEGLERVARYSMEDAKVTYELGREFFPMEAQLSRLIGQSLWDVSRSTGNLVEWFLLRK
AYKRNELAPNKPDERELARRRGYAGGYVKEPERGLWDNIVYLDFRSLYPSIIITHNVSP
DTLNREGCKEYDVAPEVGHKFCKDFPGFIPSL LGDLLEERQKIKRKM KATVDPLEKKLLD
YRQRAIKILANSFYGYGYAKARWYCKECAESVTAWGREYIEMVIRELEEKFGFKVLYAD
TDGLHATIPGADAETVKKKAKEFLKYINPKLPGLLELEYEGFYVRGFFVTKKKYAVIDEE
GKITTRGLEIVRRDWSEIAKETQARVLEAILKHGDVEEAVRIVKEVTEKLSKYEVPPEKL
VIHEQITRDLRDYKATGPHVAVAKRLAARGVKIRPGTVISYIVLKSGRIGDRAIPADEF
DPTKHRYDAEYYIENQVLP AVERILKAFGYRKEDLRYQKTKQVGLGAWLKVKGKK

FIG. 9

Therminator polymerase (SEQ ID NO:8)

MILDTDYITENGKPVIRVFKKENGEFKIEYDRTFEPYFYALLKDDSAIEDVKKVTAKRHG
TVVKVKRAEKVQKKFLGRPIEVWKLYFNHPQDVPAIRDRIRAHPAVVDIYEYDIPFAKRY
LIDKGLIPAEGDEELTMLAFAIATLYHEGEEFGTGPILMISYADGSEARVITWKKIDLPI
VDVNSTEKEMIKRFLRVVREKDPDVLITYNGDNFDFAYLKKRCEELGIKFTLGRDGSEPK
IQRMGDRFAVEVKGRIHFDLYPVIRRTINLPTYTLEAVYEAVFGKPKEKVYAEIEAQAW
SGEGLERVARYSMEDAKVTYELGREFFPMEAQLSRLIGQSLWDVSRSTGNLVEWFLLRK
AYKRNELAPNKPDERELARRRGYAGGYVKEPERGLWDNIVYLDFRSLYPSIIITHNVSP
DTLNREGCKEYDVAPEVGHKFKCDFPGFIPSLGDLLEERQKIKRKMKATVDPLEKKLLD
YRQRLIKILANSFYGYGYAKARWYCKECAESVTAWGREYIEMVIRELEEKFGFKVLYAD
TDGLHATIPGADAETVKKKAKEFLKYINPKLPGLLELEYEGFYVRGFFVTKKKYAVIDEE
GKITTRGLEIVRRDWSEIAKETQARVLEAILKHGDVEEAVRIVKEVTEKLSKYEVPPPEKL
VIHEQITRDLRDYKATGPHVAVAKRLAARGVKIRPGTVISYIVLKSGRIGDRAIPADEF
DPTKHRYDAEYYIENQVLPAPERILKAFGYRKEDLRYQKTKQVGLGAWLKVKGKK

FIG. 10

Vent polymerase UniProtKB - P30317 (DPOL_THELI) (SEQ ID NO:9)

MILDTDYITKDGKPIIRIFKKENGFEFKIELDPHFQPYIYALLKDDSAIEEIKAIKGERHG
KTVRVLDVAVKVRKKFLGREVEVWKLIFEHPQDVPAMRGKIREHPAVVDIYEYDIPFAKRY
LIDKGLIPMEGDEELKLLAFDIETFYHEGDEFGKGEIIMISYADEEEARVITWKNIDLPIY
VDVVSNEREMIKRFVQVVKEKDPDVIITYNGDNFDLPYLIKRAEKLGVRLVLGRDKEHPE
PKIQRMGDSFAVEIKGRIHFDLFPVVRRTINLPTYTLEAVYEAVLGKTKSKLGAEIEAAI
WETEE SMKLAQYSMEDARATYELGKEFFPMEAE LAKLIGQSVWDVSRSTGNLVEWYLL
RVAYARNELAPNKPDEEEYKRRLRTTYLGGYVKEPEKGLWENIIYLDFRSLYPSIIVTHN
VSPDTLEKEGCKNYDVAPIVG YRFCKDFPGFIP SILGDLIAMRQDIKKMKSTIDPIEKK
MLDYRQRAIKLLANSILPNEWLP IENG EIKFVKIGEFINSYMEKQKENVKTVENTEVLE
VNNLFAFSFNKKIKESEVKKVKALIRHKYKGKAYEIQ LSSGRKINITAGHSLFTVRNGEI
KEVSGDGIKEGDLIVAPKKIKLNEKGVSINIPELISDLSEETADIVMTISAKGRKNFFK
GMLRTL RWMFGEENRRIRTFNRYLFHLEKLGLIKLLPRGYEVTDWERLKKYKQLYEKL
SVKYNGNKREYLVMFNEIKDFISYFPQKELEEWKIGTLNGFRTNCILKVDEDFGKLLGYY
VSEGYAGA QKNKTGGISYSVKLYNEDPNVLESMKNVAEKFFGKVRVDRNCVSI SKKMAYL
VMKCLCGALAENKRIPSVILTSPEPV RWSFLEAYFTGDGDIHPSKRFR LSTKSELLANQL
VFLNSLGISSVKIGFDSGVYRVYINEDLQFPQTSREKNTYYSNLIPKEILRDVFGKEFQ
KNMTFKKFKELVDSGKLNREKAKLLEFFINGDIVLDRVKS VKEKDYEGYVYDLSVEDNEN
FLVGFGLLYAHNSYGYMGYPKARWYSKECAESVTAWGRHYIEMTIREIEEKFGFKVLYA
DSVSGESEIIIRQNGKIRFVKIKDLFSKVDYSIGEKEYCILEGVEALTLD DDDGKLVWKPV
PYVMRHRANKRMFRIWL TNSWYIDVTEDHSLIGYLN TSKTKTAKKIGERLKEVKPFELGK
AVKSLICPNAPLK DENTKTSEIAVKFWELVGLIVGDGNWGGDSRWAEYYLGLSTGKDAEE
IKQKLEPLKTYGVISNYYPKNEKGDFNILAKSLVKFMKRHFKDEKGRRKIPEFMYELPV
TYIEAFLRGLFSADGTVTIRKGVPEIRLTNIDADFLREVRKLLWIVGISNSIFAETTPNR
YNGVSTGTYSKHLRIKNKWRFAERIGFLIERKQKR LLEHLKSARVKRNTIDFGFDLVHVK
KVEEIPYEGYVDIEVEETHRFFANNILVHNTDGFYATIPGEKPELIK KAKEFLNYINS
KLPGLLELEYEGFYLRGFFVTKKRYAVIDEEGRITTRGLEVVRRDWSEIAKETQAKVLEA
ILKEGSVEKAVEVVRDVVEKIAKYRVPLEKLV IHEQITRDLKDYKAIGPHVAIAKRLAAR
GIKVKPGTIIISYIVLKGSGKISDRVILLTEYDPRKH KYDPDYIENQVLP AVLRI LEAFG
YRKEDLRYQSSKQTGLDAWLKR

FIG. 11

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Deep Vent polymerase UniProtKB - Q51334 (DPOL_PYRSD) (SEQ ID NO:10)

MILDADYITEDGKPIIRIFKKENGFEKVEYDRNFRPYIYALLKDDSQIDEVRKITAERHG
KIVRIIDAEKVRKKFLGRPIEVWRLYFEHPQDVPAIRDKIREHSAVIDIFEYDIPFAKRY
LIDKGLIPMEGDEELKLLAFDIETLYHEGEEFAKGPIIMISYADEEEAKVITWKKIDLPY
VEVVSSSEREMIKRFLKVIREKDPDVIITYNGDSFDLPYLVKRAEKLGIKLPGRDGSEPK
MQRLGDMTAVEIKGRIHFDLYHVIRRTINLPTYTLEAVYEAI FGKPKEKVYAHEIAEAW
TGKGLERVAKYSMEDAKVTYELGREFFPMEAQLSRLVGQPLWDVSRSTGNLVEWYLLRK
AYERNELAPNKPDEREYERRLRESYAGGYVKEPEKGLWEGLVSLDFRSLYPSIIITHNVS
PDTLNREGCREYDVAPEVGHKFKCDFPGFIPSLKRLDERQEIKRKMASKDPIEKKML
DYRQRAIKILANSILPEEWVPLIKNGKVKIFRIGDFVDGLMKANQGKVKKTGDTEVLEVA
GIHAFSFDKRSKKARVMAVKAVIRHRYSGNVYRIVLNSGRKITITEGHS LFVYRNGDLVE
ATGEDVKIGDLLAVPRSVNLPEKRERLNIVELLLNLSPEETEDIILTIPVKGRKNFFKGM
LRTLRFWIFGEEKRVRTASRYLRHLENLGYIRLRKIGYDIIDKEGLEKYRTLYEKLVDVVR
YNGNKREYLVEFNAV RDVISLMPEEELKEWRIGTRNGFRMGTFVDIDEDFAKLLGYVSE
GSARKWKNQTGGWSYTVRLYNENDEVLD DMEHLAKKFFGKV KRGKNYVEIPKKMAYIIIFE
SLCGTLAENKRVPEVIFTSSKGVRWAFLEGYFIGDGDVHPSKRVRLSTKSELLVNGLVLL
LNSLGVSAIKLGYDSGVYRVYVNEELKFTEYRKKKNVYHSHIVPKDILKETFGKV FQKNI
SYKKFRELVENGLDREKAKRIEWLLNGDIVLDRVVEIKREYYDGYVYDLSVDEDENFLA
GFGFLYAHNSYGYGYAKARWYCKECAESVTAWGREYIEFVRKELEEKFGFKVLYIDTD
GLYATIPGAKPEEIKKKALEFVDYINAKLPGLLELEYEGFYVRGFFVTKKKYALIDEEGK
IITRGLEIVRRDWSEIAKETQAKVLEAILKHGNVEEAVKIVKEVTEKLSKYEIPPEKLV
YEQITRPLHEYKAIGPHVAVAKRLAARGVKVRPGMVIGYIVLRGDGPISKRAILAEEDL
RKHKYDAEYYIENQVLPVLRILEAFGYRKEDLRWQTKQTGLTAWLNIIKKK

FIG. 12

Pfu polymerase UniProtKB - P61875 (DPOL_PYRFU) (SEQ ID NO:11)

MILDVDYITEEGKPVIRLFKKENGKFKIEHDRTFRPYIYALLRDDSKEIEVKKITGERHG
KIVRIVDVEKVEKKFLGKPITVWKLYLEHPQDVPTIREKVREHPAVVDIFEYDIPFAKRY
LIDKGLIPMEGEEELKILAFDIETLYHEGEEFGKGPIIMISYADENEAKVITWKNIDLPI
VEVVSSSEREMIKRFLRIIREKDPDIIVTYNGDSFDFPYLAKRAEKLGIKLTIGRDGSEPK
MQRIGDMTAVEVKGRIHFDLYHVITRTINLPTYTLEAVYEAI FGKPKVKYADEIAKAW
SGENLERVAKYSMEDAKATYELGKEFLPMEIQLSRLVGQPLWDVSRSTGNLVEWFLLRK
AYERNEVAPNKPSEEEYQRLRESYTGGFVKEPEKGLWENIVYLDLFRALYPSIIITHNVS
PDTLNLEGCKNYDIAPQVGHKFCKDIPGFIPSLLGHLLEERQKIKTKMKETQDPIEKILL
DYRQKAIKLLANSFYGGYGYAKARWYCKECAESVTAWGRKYIELVWKELEEKFGFKVLYI
DTDGLYATIPGGESEEEKKALEFVKYINSKLPGLLELEYEGFYKRGFFVTKKRYAVIDE
EGKVITRGLIVRRDWSEIAKETQARVLETILKHGDVEEAVRIVKEVIQKLANYEIPPEK
LAIYEQITRPLHEYKAIGPHVAVAKKLAAGVKIKPGMVIGYIVLRGDGPISNRAIAEE
YDPKKHKYDAEYYIENQVLPVAVLRILEGFGYRKEDLRYQKTRQVGLTSWLNKKS

FIG. 13**Pyrococcus abyssi polymerase UniProtKB - P0CL77 (DPOL_PYRAB) (SEQ ID NO:12)**

MIIDADYITEDGKPIIRIFKKEKGFEKVEYDRTFRPYIYALLKDDSAIDEVKKITAERHG
KIVRITEVEKVQKKFLGRPIEVWKLYLEHPQDVPAIREKIREHPAVVDIFEYDIPFAKRY
LIDKGLTPMEGNEELTFLAVDIETLYHEGEEFGKGPIIMISYADEEGAKVITWKSIDLPI
VEVVSSSEREMIKRLVKVIREKDPDVIITYNGDNFDFPYLLKRAEKLGIKLPGRDNSEPK
MQRMGDSLAVEIKGRIHFDLFPVIRRTINLPTYTLEAVYEAI FGKSKEKVYAHEIAEAW
TGKGLERVAKYSMEDAKVTFELGKEFFPMEAQLARLVGQPVWDVSRSTGNLVEWFLLRK
AYERNELAPNKPDEREYERRLRESYEGGYVKEPEKGLWEGIVSLDFRSLYPSIIITHNVS
PDTLNRENCKEYDVAPQVGHFCKDFPGFIPSLGNLLEERQKIKKRMKESKDPVEKKLL
DYRQRAIKILANSYYGGYGYAKARWYCKECAESVTAWGRQYIDLVRRELESRGFKVLYID
TDGLYATIPGAKHEEIKEKALKFVEYINSKLPGLLELEYEGFYARGFFVTKKKYALIDEE
GKIVTRGLEIVRRDWSEIAKETQAKVLEAILKHGNVDEAVKIVKEVTEKLSKYEIPPEKL
VIYEQITRPLSEYKAIGPHVAVAKRLAAGVKVKPGMVIGYIVLRGDGPISKRAIAIEEF
DPKKHKYDAEYYIENQVLPVAVLRILEGFGYRKEDLKYQKTKQVGLGAWLKF

FIG. 14

RB69 polymerase UniProtKB - Q38087 (DPOL_BPR69) (SEQ ID NO:13)

MKEFYLTVEQIGDSIFERYIDSNGRERTREVEYKPSLFAHCPESQATKYFDIYGKPCTRK
LFANMRDASQWIKRMEDIGLEALGMDDFKLAYLSDTYNYEIKYDHTKIRVANFDIEVTSP
DGFPEPSQAKHPIDAITHYDSIDDRFYVFDLLNSPYGNVEEWSIEIAAKLQEQQGDEVPS
EIIDKIIYMPFDNEKELLMEYLNFWQQKTPVILTGWNVESFDIPYVYNRIKNIFGESTAK
RLSPHRKTRVKVIENMYGSREIITLFGISVLDYIDLYKKFSFTNQPSYSLDYISEFELNV
GKLKYDGPISKLRSENHQRYISYNIIDVYRVLQIDAKRQFINLSLDMGYAKIQIQSVFS
PIKTWDAAIFNSLKEQNKVIPQGRSHPVQPYPGAFFVKEPIPNRYKYVMSFDLTSLYPSII
RQVNISPETIAGTFKVAPLHDYINAVAERP SDVYSCSPNGMMYYKDRDGVVPTEITKVFN
QRKEHKG YMLAAQRNGEIIKEALHNPNLSVDEPLD VDYRFD FSDEIKEKIKKLSAKSLNE
MLFRAQRTEVAGMTAQINRKLLINSLYGALGNVWFRYYDLRNATAITTFGQMALQWIERK
VNEYLNEVCGTEGEAFVLYGDTDSIYVSADKIIDKVGESKFRDTNHWVDFLDKFARERME
PAIDRGFREMCEYMNNKQHLMFMDREAIAGPPLGSKGIGGFWTGKKRYALNVWDMEGTRY
AEPKLIKIMGLETQKSSTPKAVQKALKECIRMLQEGEESLQEYFKEFEKEFRQLNYISIA
SVSSANNIAKYDVGGFPGPKCPFHIRGILTYNRAIKGNIDAPQVVEGEKVYVLP LREGNP
FGDKCIAWPSGTEITDLIKDDVLHWM DYTVLLEKTFIKPLEGFTSAAKLDYEKKASLFDM
FDF

FIG. 15

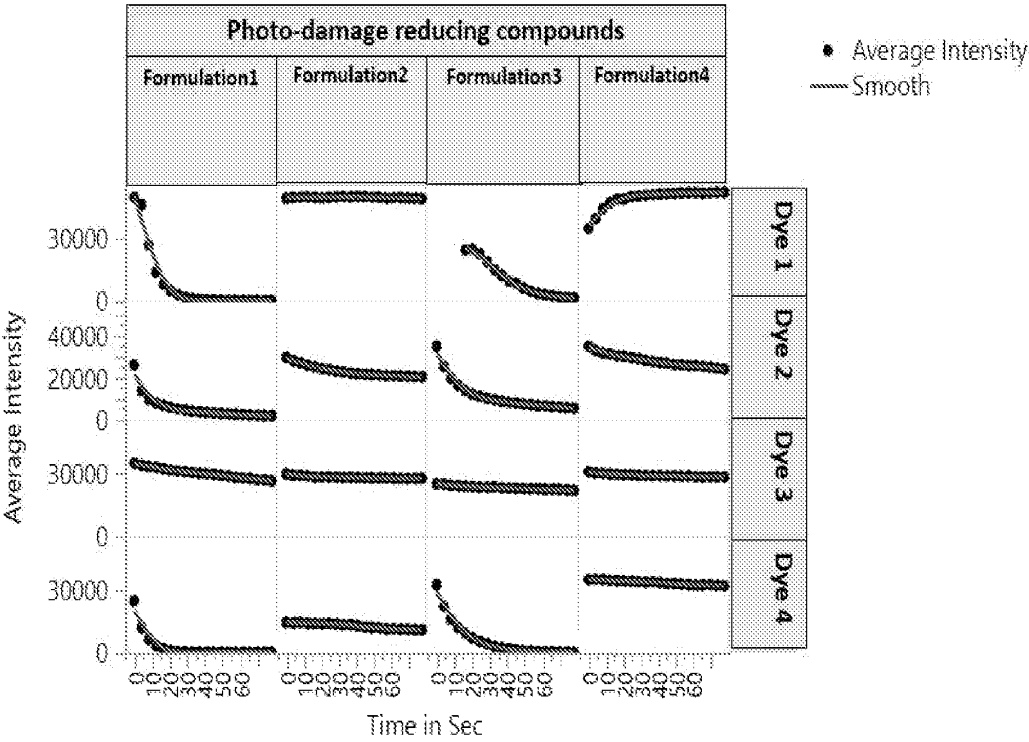


FIG. 16

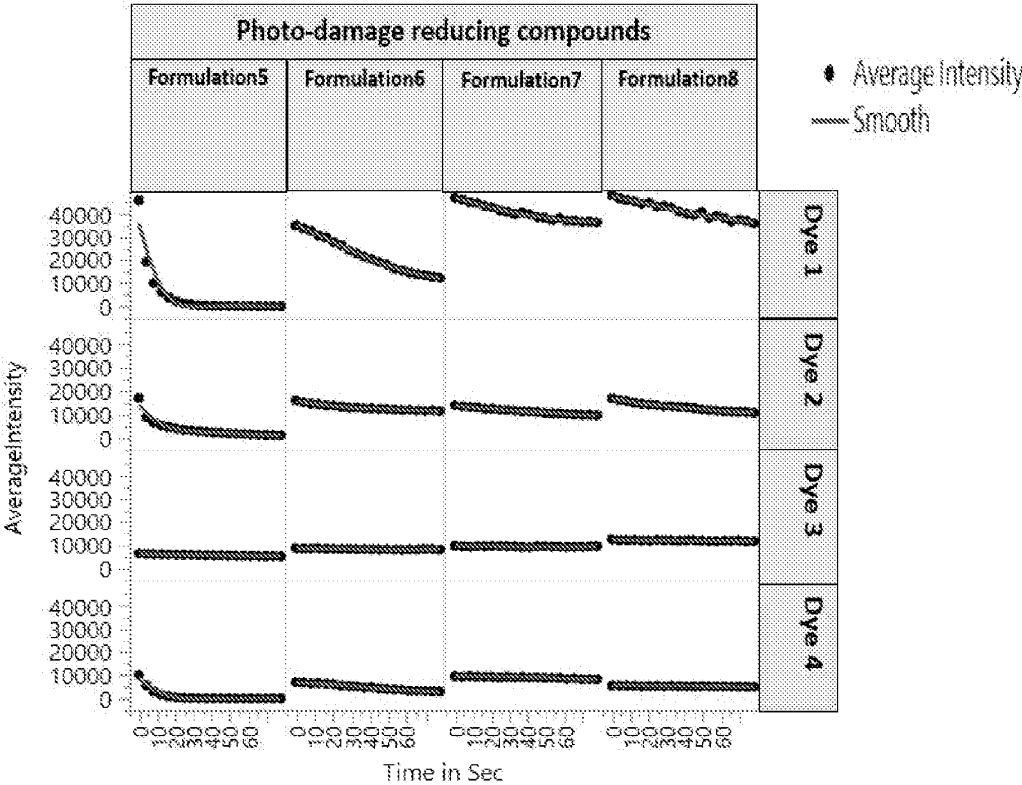


FIG. 17

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No residual were observed after 90 Sec
exposure with high laser power

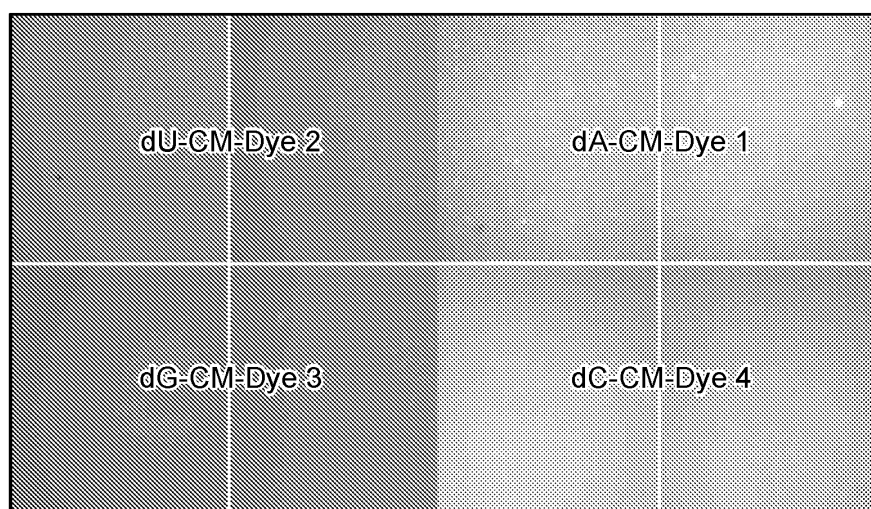


FIG. 18

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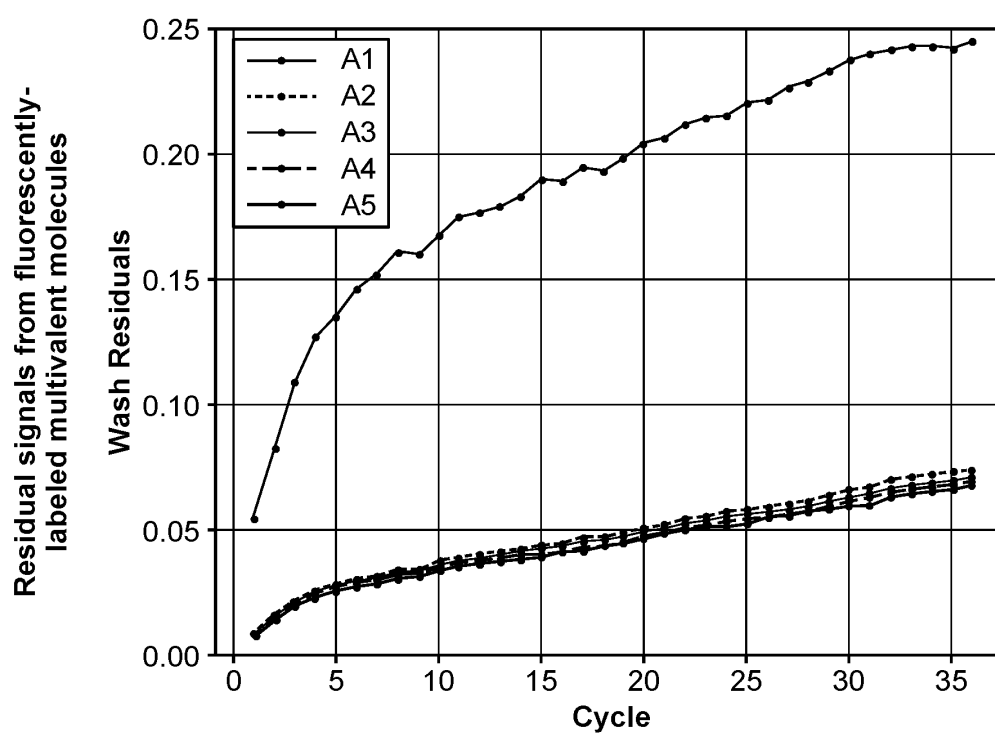


FIG. 19

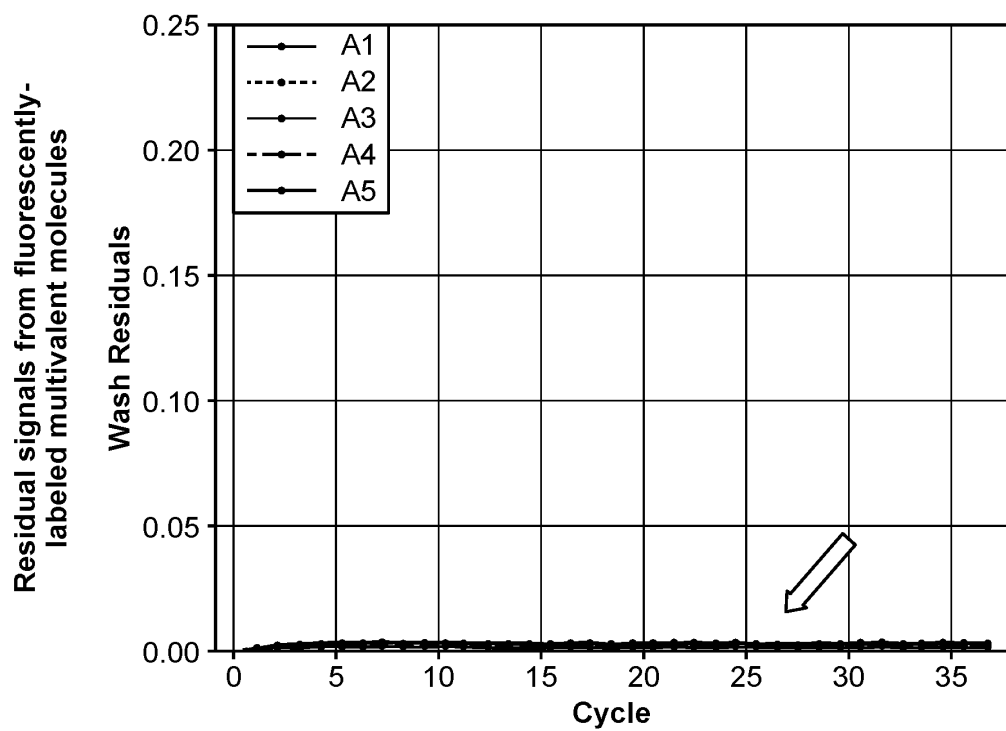


FIG. 20

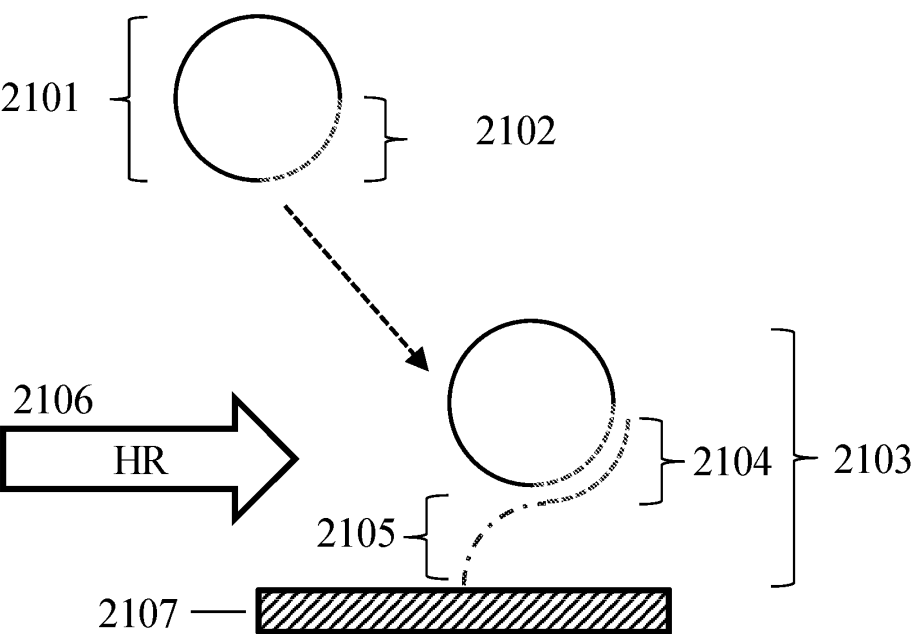


FIG. 21A

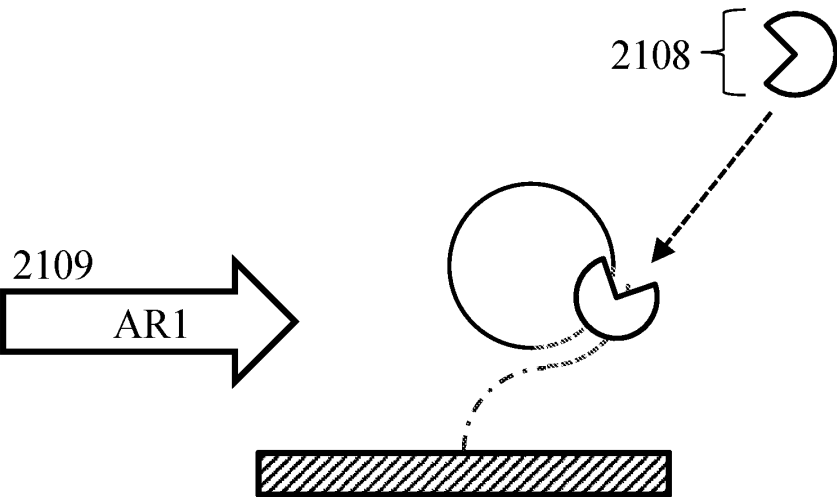


FIG. 21B

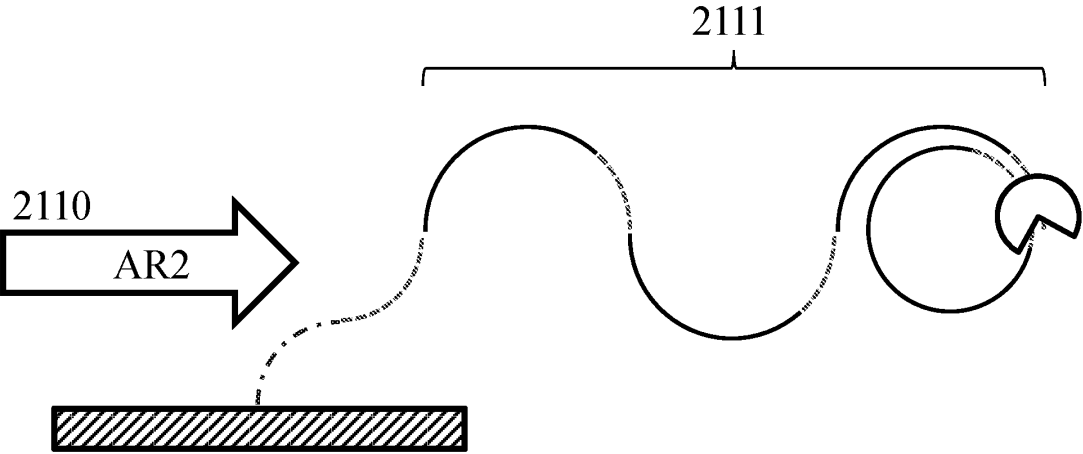


FIG. 21C

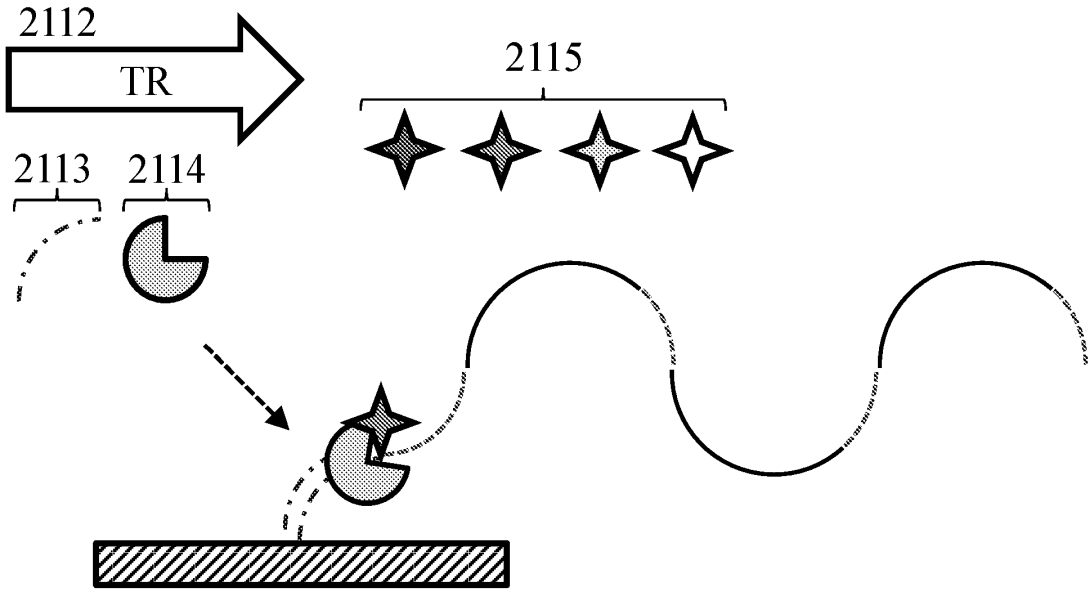
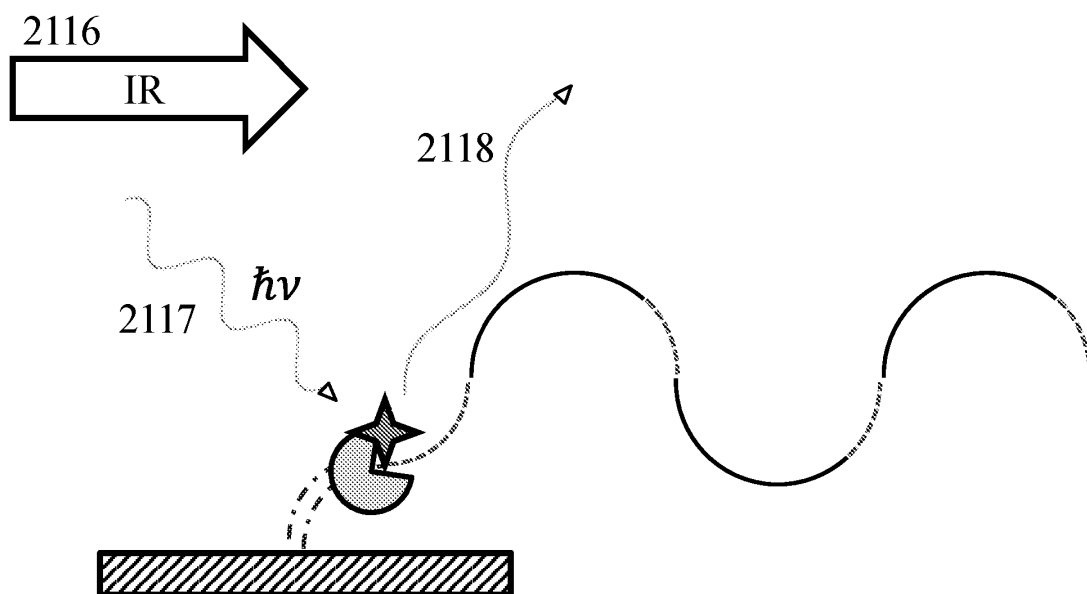
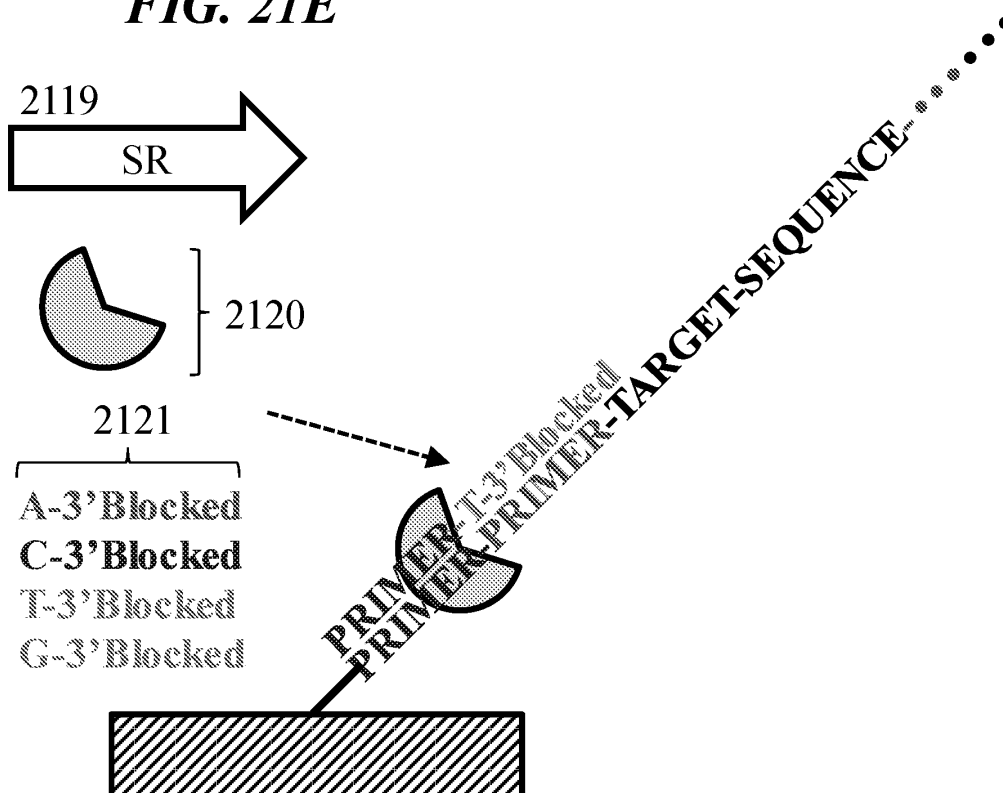


FIG. 21D

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**FIG. 21E****FIG. 21F**

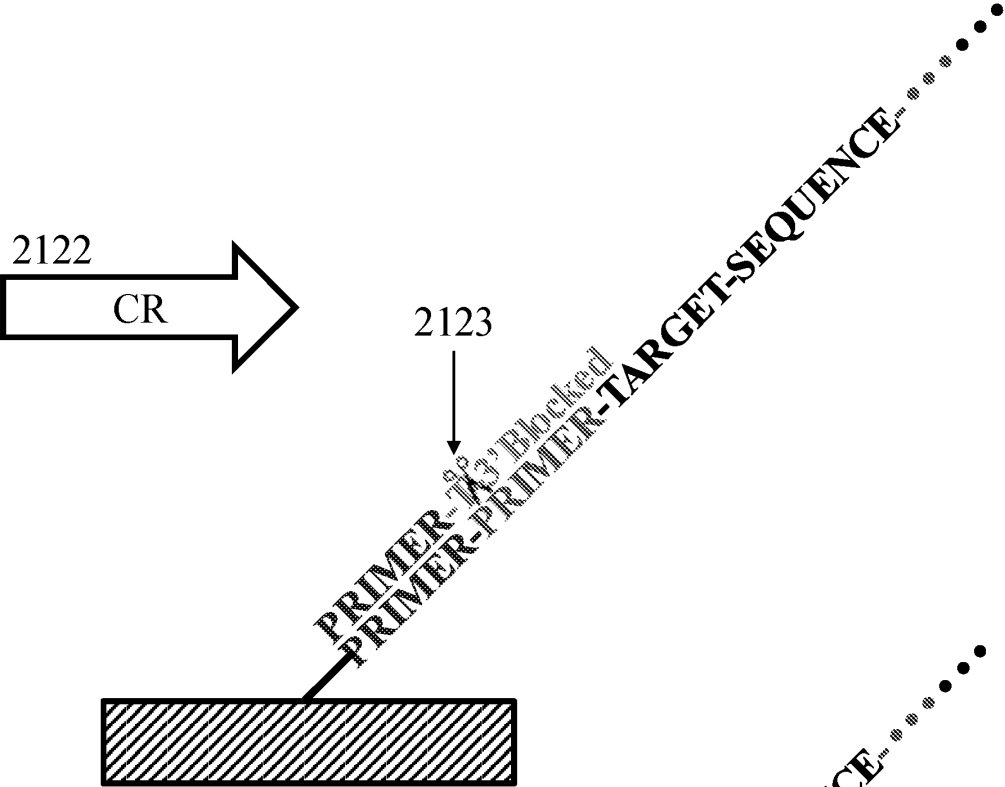


FIG. 21G

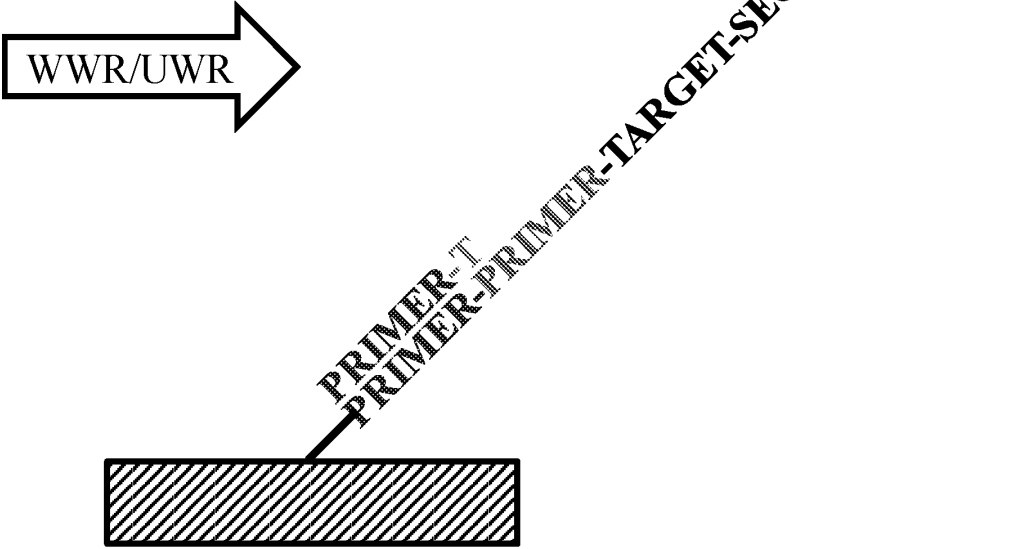


FIG. 21H

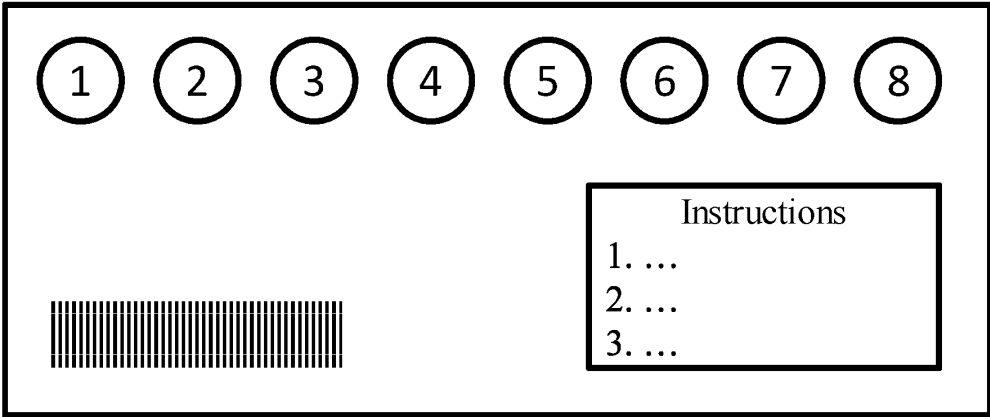


FIG. 22A

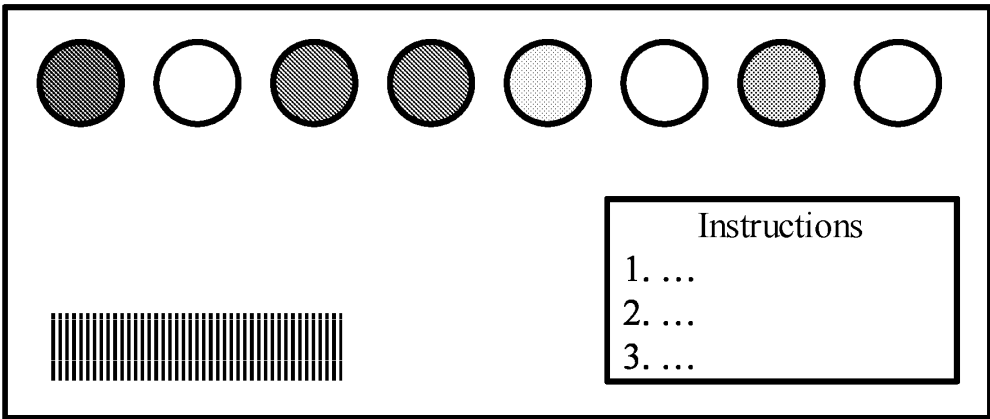


FIG. 22B

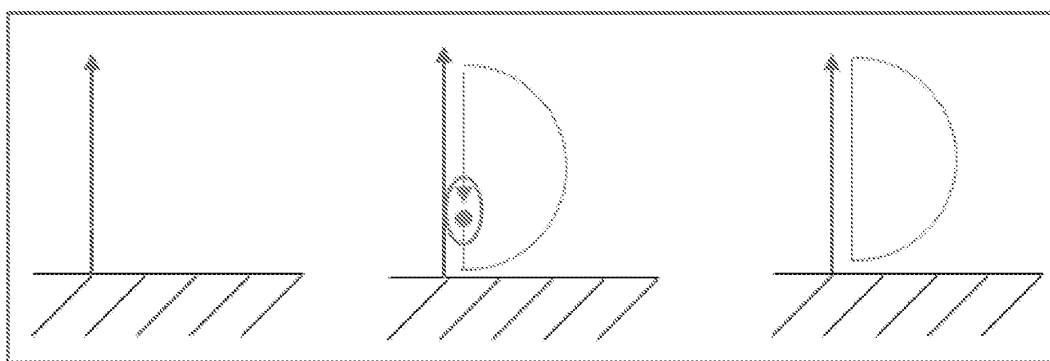


FIG. 23

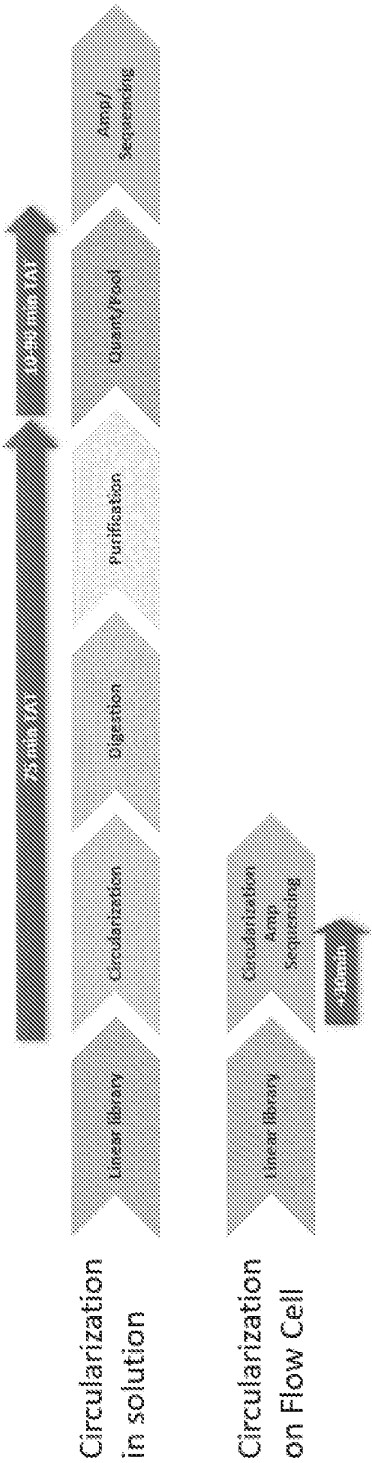
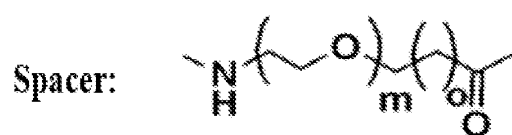


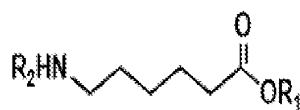
FIG. 24

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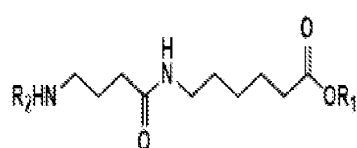


Linkers:

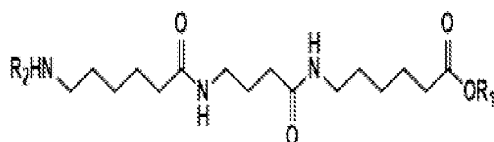
11 atom Linker:



16 atom Linker:



23 atom Linker:



N3 Linker:

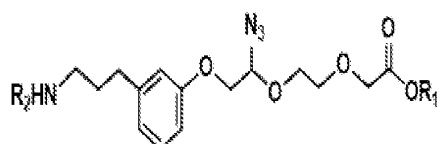
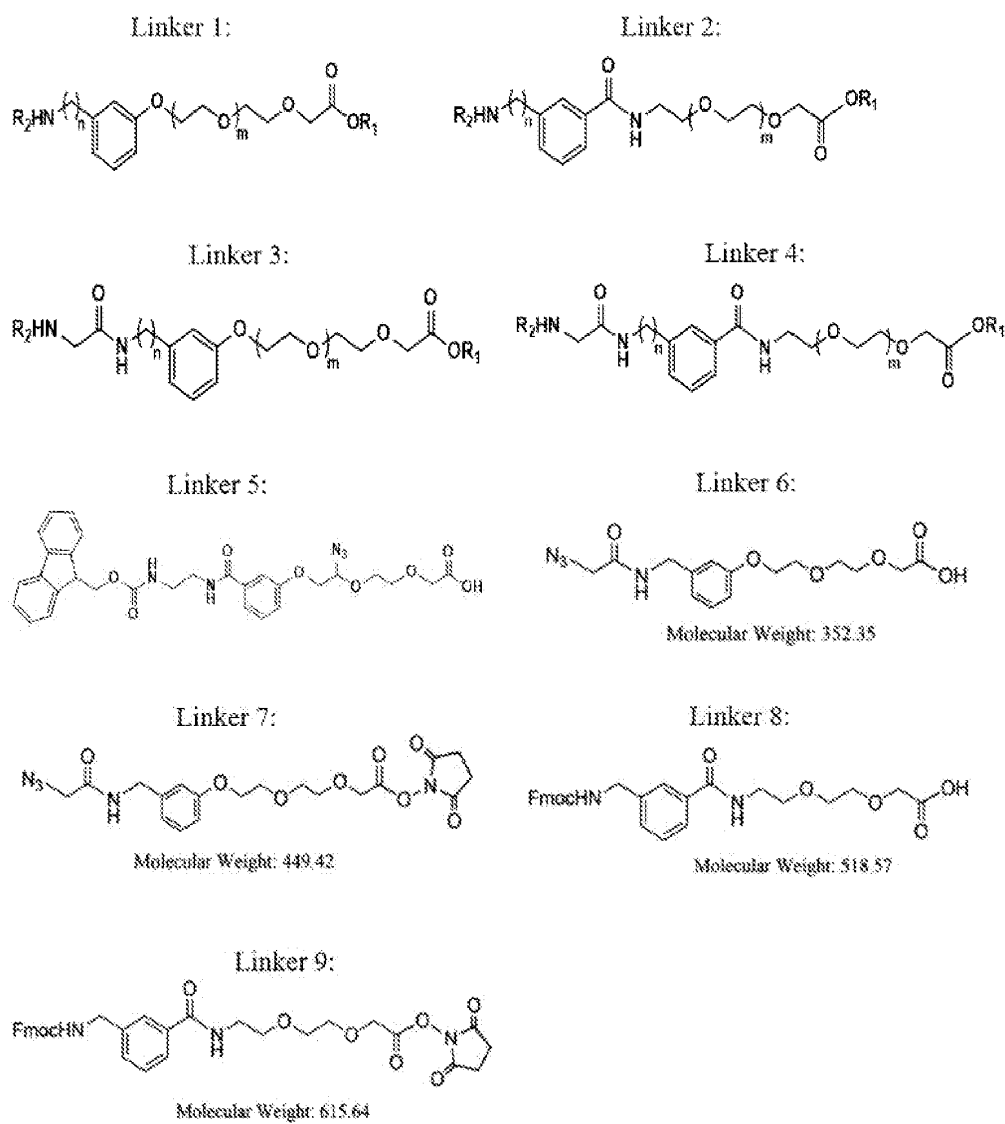
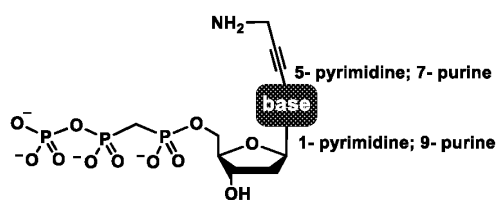
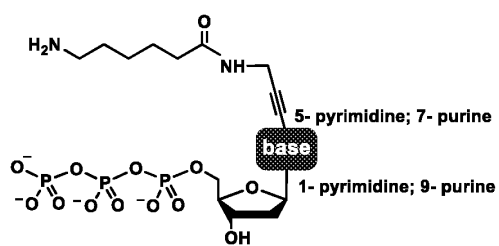
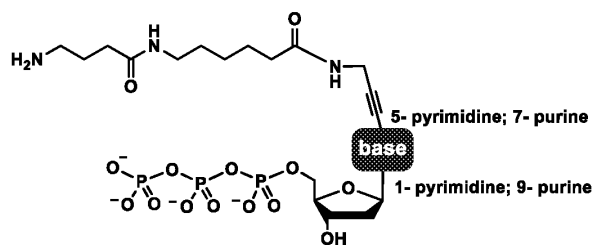


FIG. 25

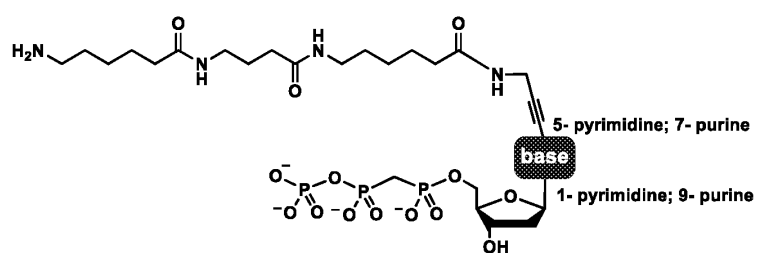
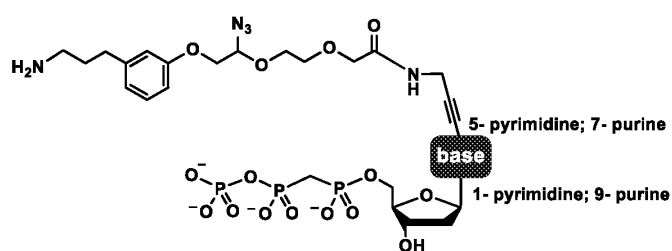
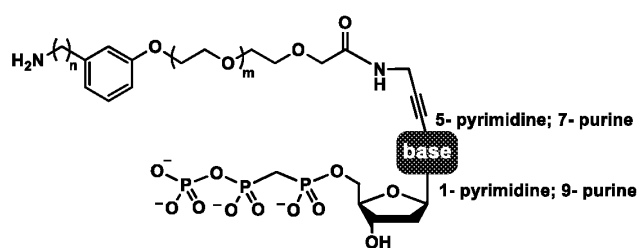
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**FIG. 26**

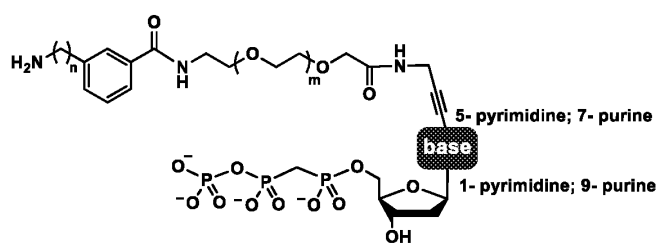
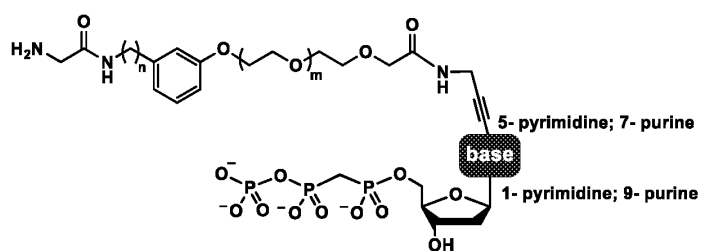
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dNTP-PA-NH₂:**dNTP-PA-11 Atom Linker-NH₂:****dNTP-PA-16 Atom Linker-NH₂:****FIG. 27**

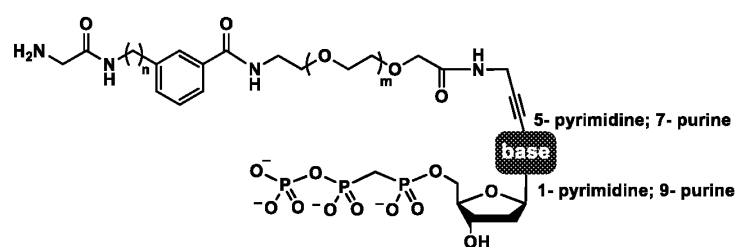
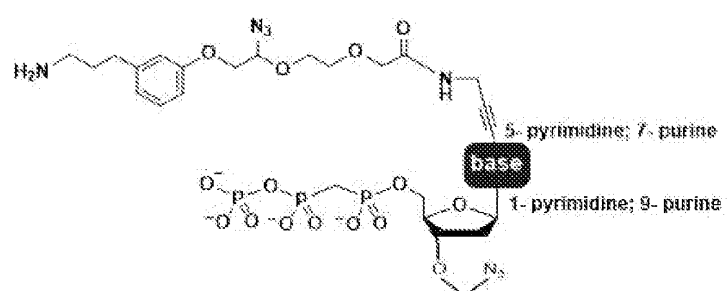
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dNTP-PA-23 Atom Linker-NH₂:**dNTP-PA-N3 Linker-NH₂:****dNTP-PA-Linker 1-NH₂:****FIG. 28**

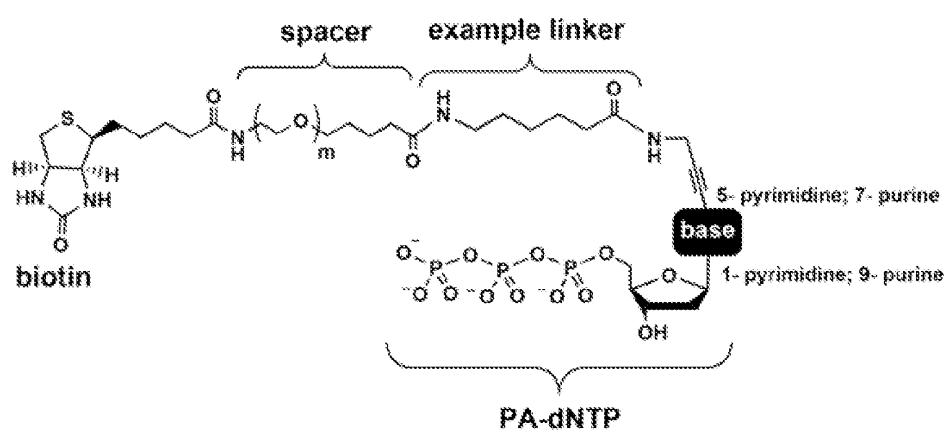
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dNTP-PA-Linker 2-NH₂:**dNTP-PA-Linker 3-NH₂:****FIG. 29**

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dNTP-PA-Linker 4-NH₂:**dNTP-PA-N3 Linker-NH₂:****FIG. 30**

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**FIG. 31**

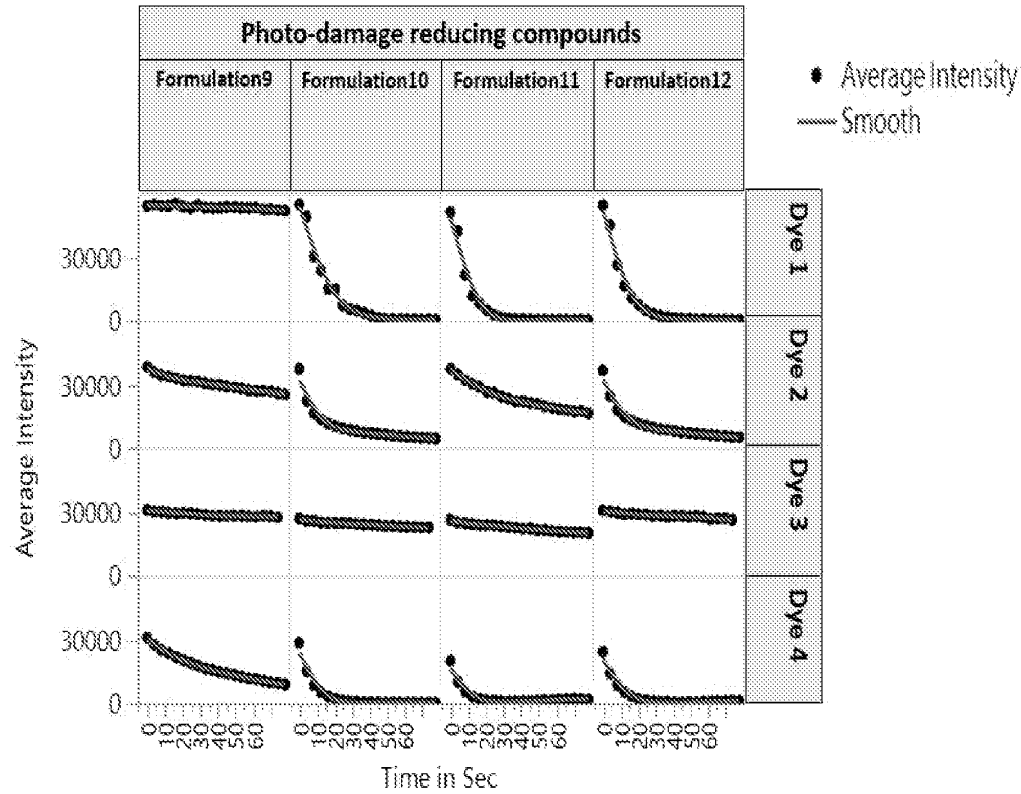


FIG. 32

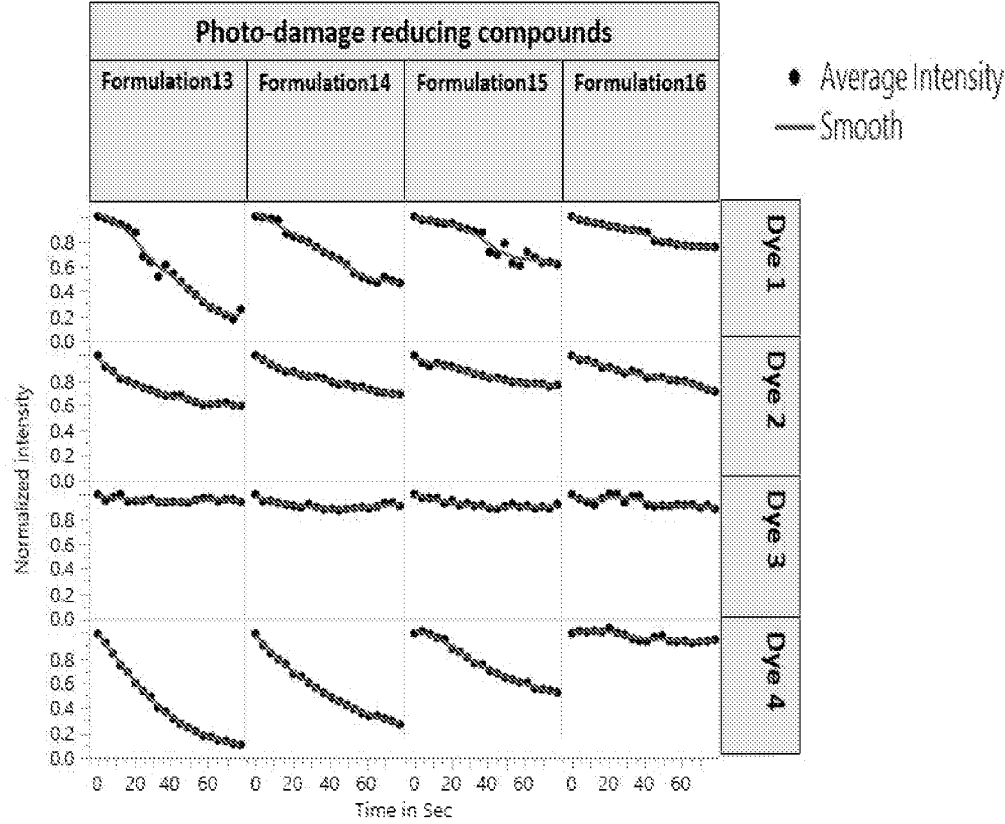
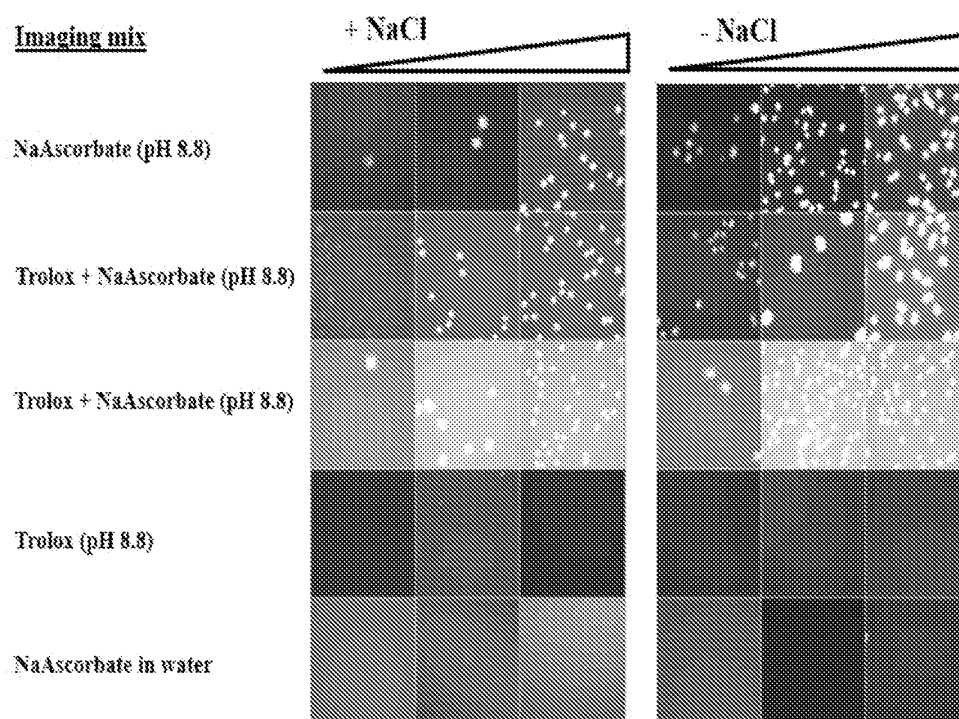


FIG. 33

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**FIG. 34**

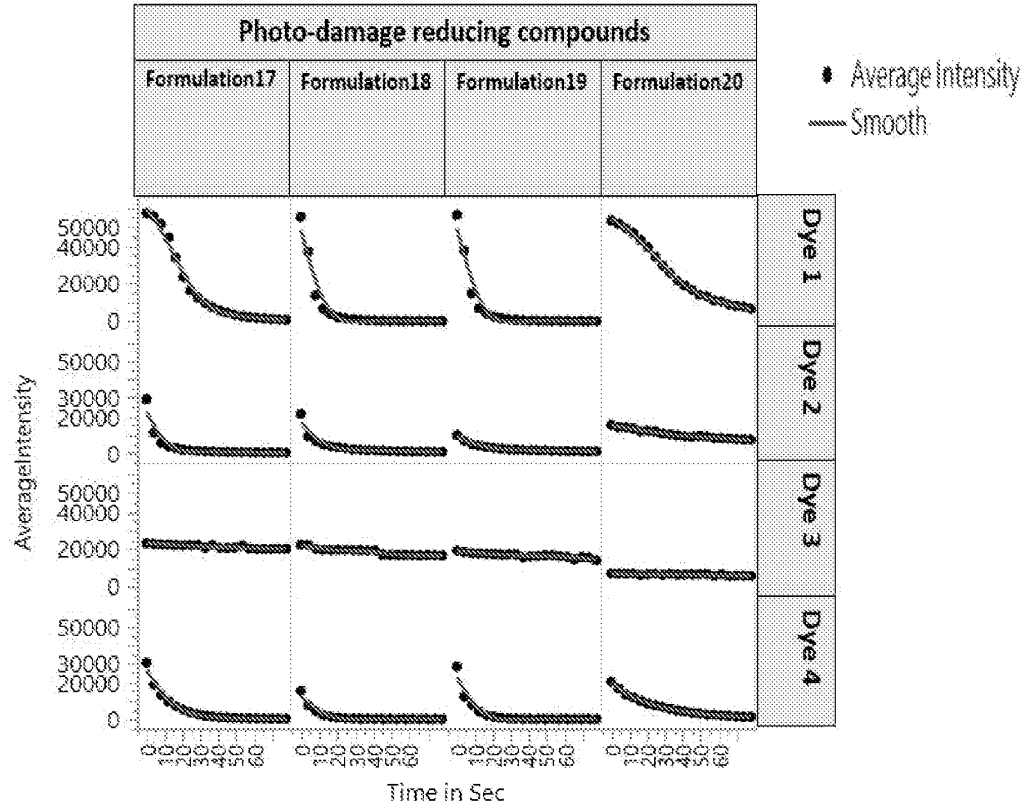


FIG. 35

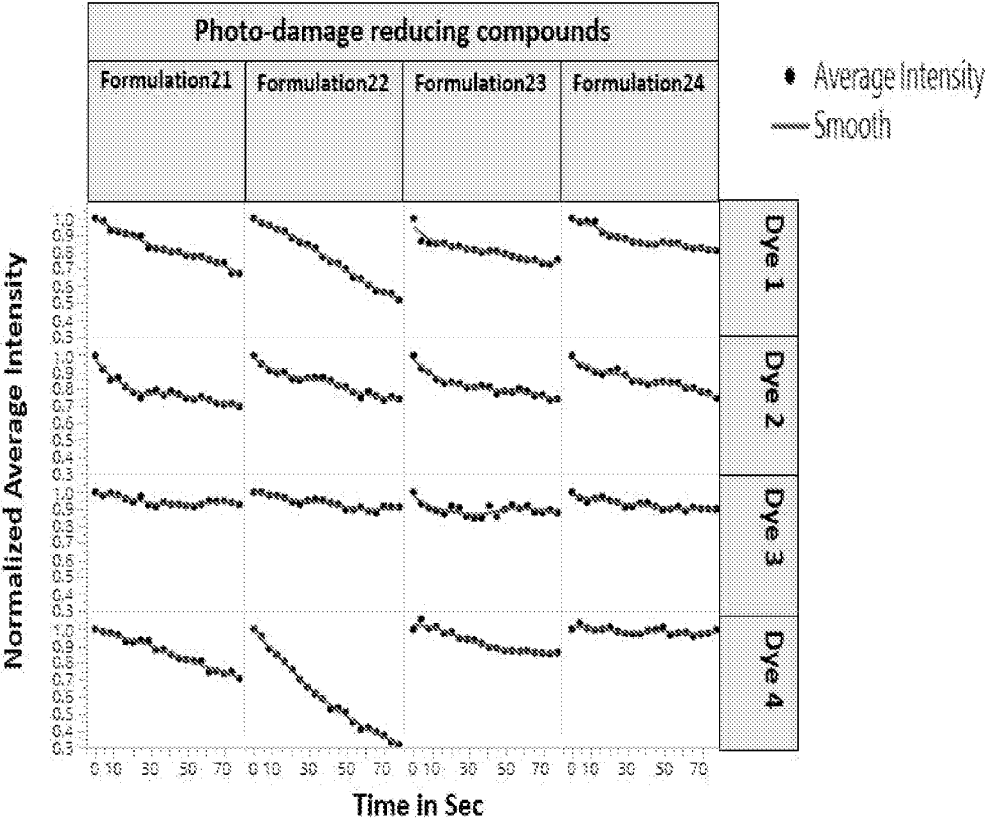


FIG. 36

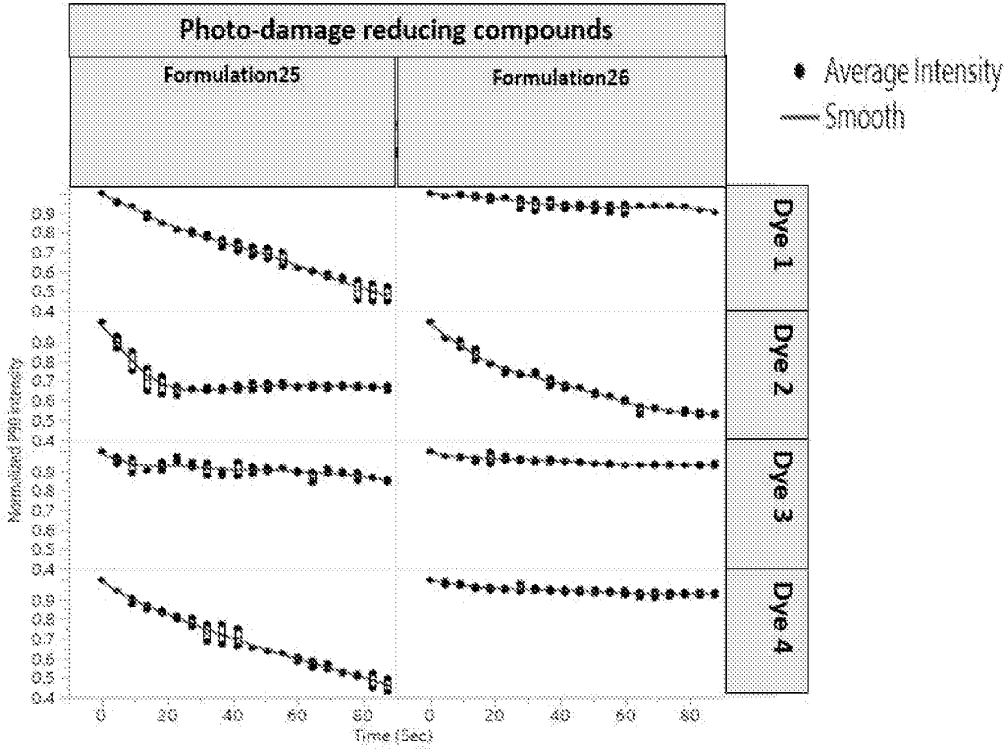


FIG. 37

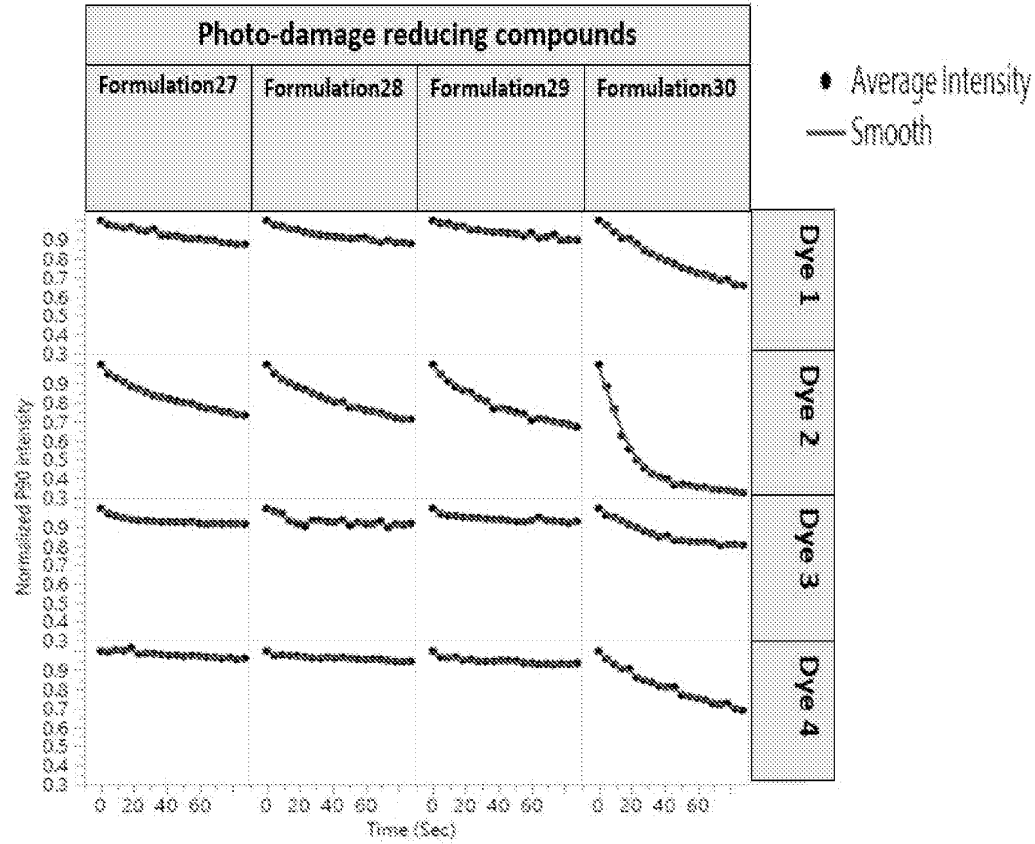


FIG. 38

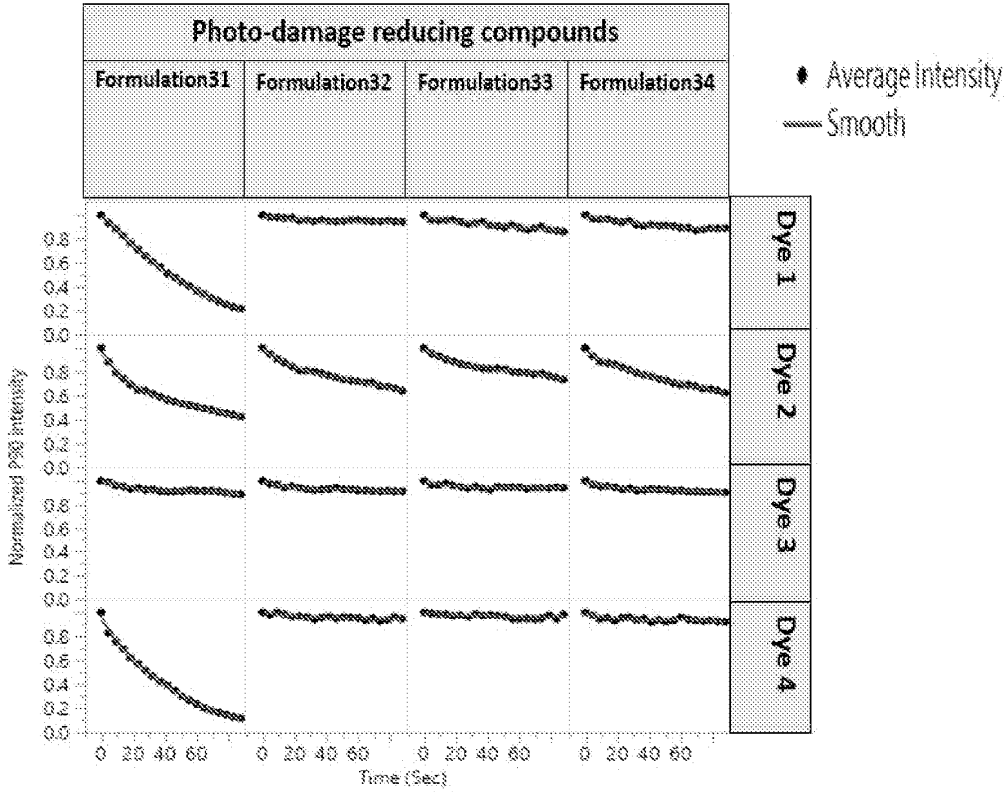


FIG. 39

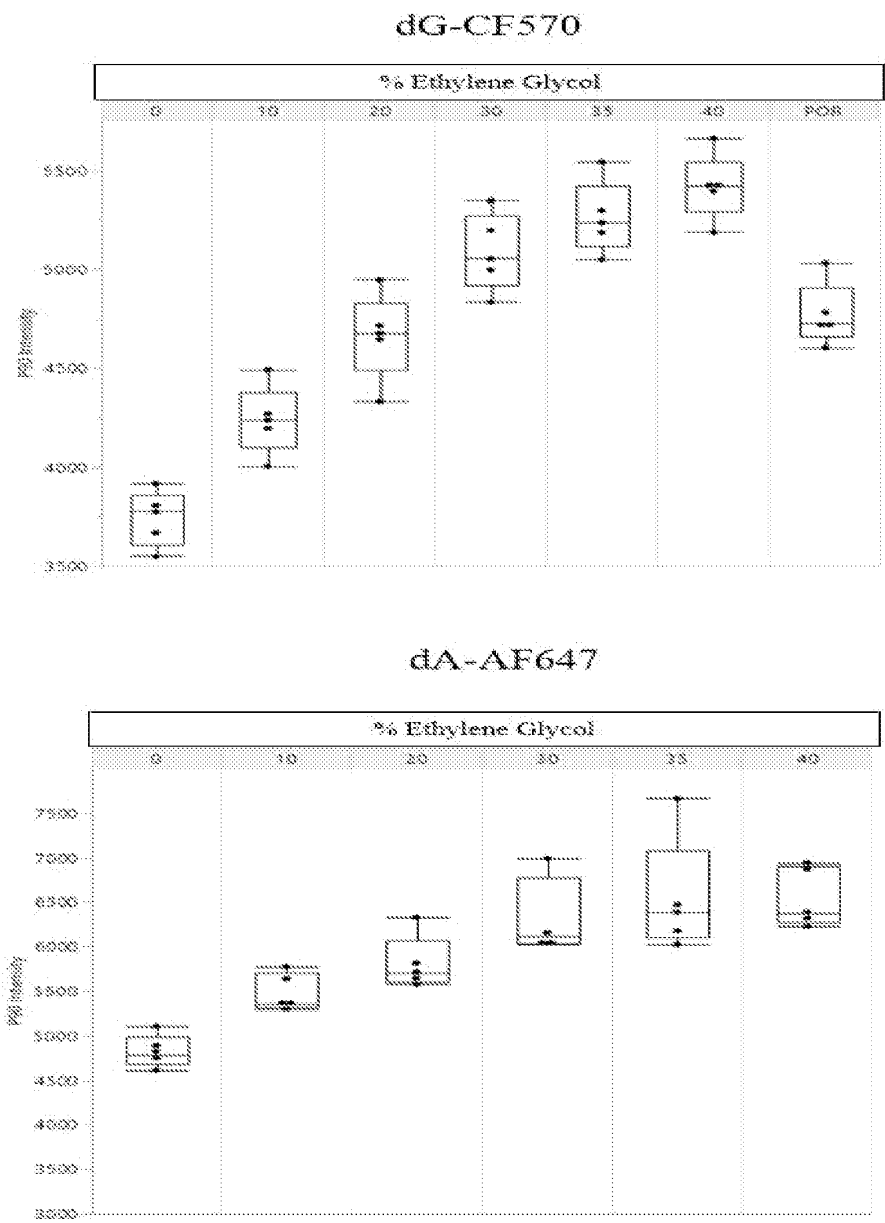


FIG. 40

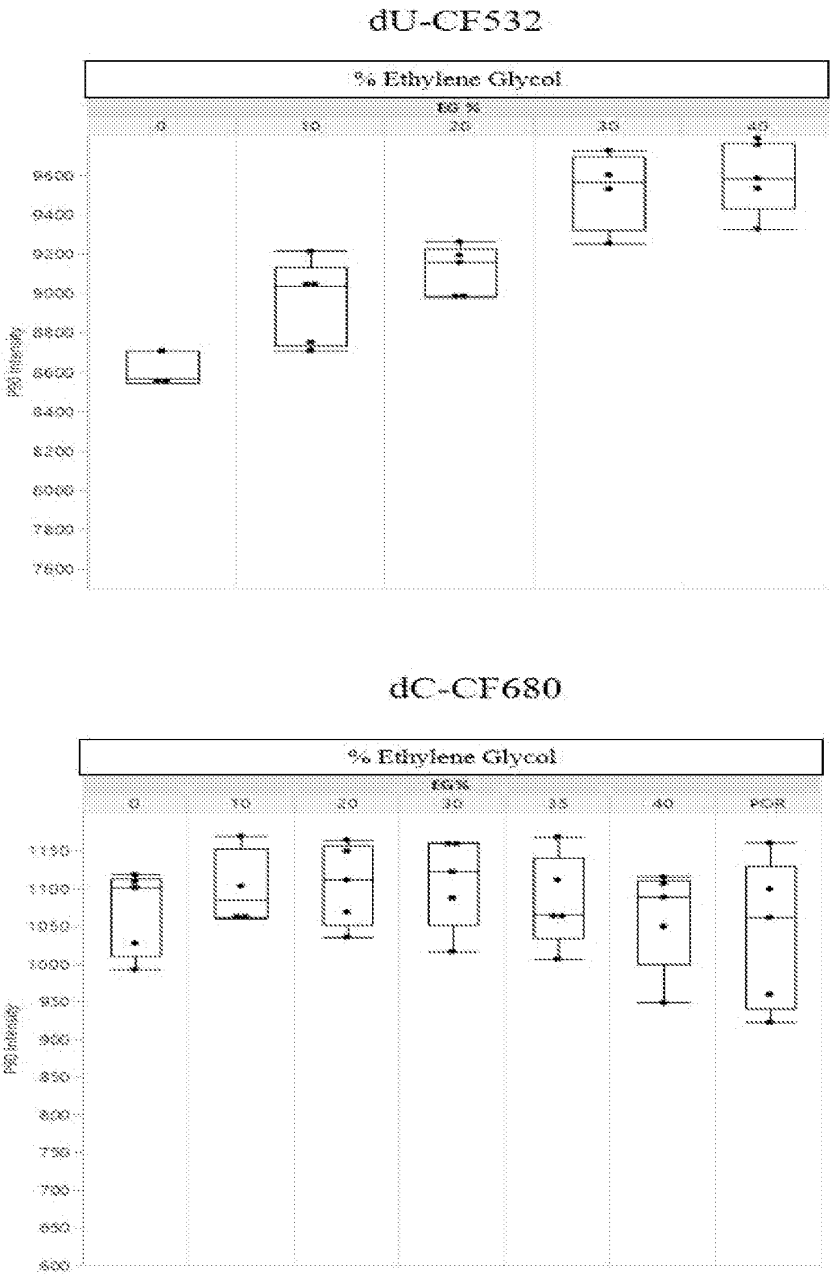


FIG. 41

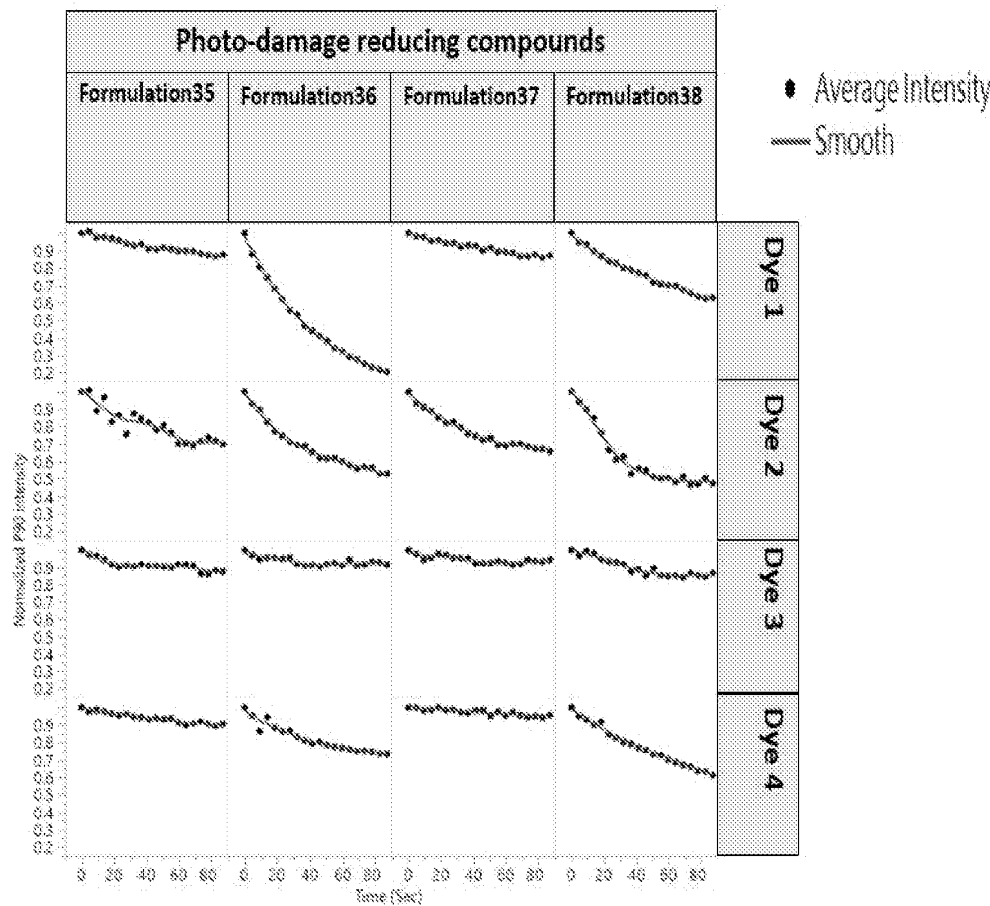


FIG. 42

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No residual were observed after 90 Sec
exposure with high laser power

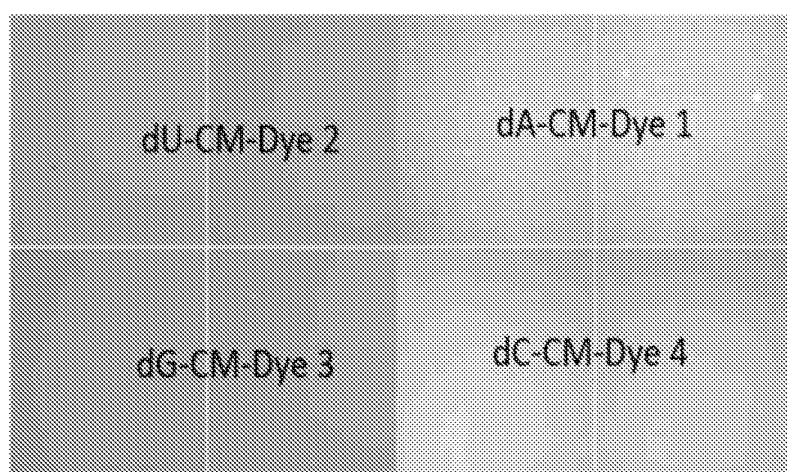


FIG. 43

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Wild type DNA polymerase from Candidatus altiarthaeales archaeon (SEQ ID NO:221)

MKKTLLDADYITREEKAVVRLFYKTEEGREIQEVADFRPYMYVLPEEHDLLKKLQREIKEL
KNITNVEIKRMIEGDREVEVLKVMVNQPRDVPNLRGLIKELEGCKEVREAHIPFAERYLI
DSGLIPMQDCENFDLRIAFAFDMEVYNPRGEPKAERDPIIIISYADNRGLRRVWVTKTVEN
LNLDYMEVLKDEREIIIRRFIDTIREREIDIIVTYNGDNFDFPYLKERAÆKHRIPVSLGVD
GSPLRLERRGMNLGARVTGRPHIDMYPVCRQIFNLSRYTLEDVYLEITGREKKDIRVGEM
AGIWDNPEKEKFKELIEYAMSDAESTLEIAITLLPLHYEISRITRELIYQSSRAGSGQRV
ESLLIKKAFEKSILVPNRPSDRVVNERQRKTYIGAYVVEPKRGIHDNILLDFRSLYPSI
IISHNIDPSTIDCECCPEDSYRSPTGHYFCKKKRGLIPETLNELVQRRIEVKKGLKNEKN
PERRRFLDVKQQALKLLANSYGYFGFPRARWYCRECAESITALGRKYILHTIDIVPKFG
FDVIYGD TDSVYLIKPNITDRERVMKNAEHFLDKINSELPEAMELEFEGFYPRGIFITKK
RYALIDERGKLIVKGLETKRRDWANIAKDTQEKVLDALLKDNPEKAASIVKDVIRNIKT
GKIPLKDLAINTQITRGMAEYKTEGPHIVAACKAMKRGLEFKQGNIVTYVVTKKGKSISD
KARVIDFVEEGDYDPDYINNQLPSVLRILEALGYSEDELKGLGKQMKLGGF

FIG. 44**Mutant DNA polymerase from Candidatus altiarthaeales archaeon (SEQ ID NO:222)**

MKKTLLDADYITREEKAVVRLFYKTEEGREIQEVADFRPYMYVLPEEHDLLKKLQREIKEL
KNITNVEIKRMIEGDREVEVLKVMVNQPRDVPNLRGLIKELEGCKEVREAHIPFAERYLI
DSGLIPMQDCENFDLRIAFA**MA**VYNPRGEPKAERDPIIIISYADNRGLRRVWVTKTVEN
LNLDYMEVLKDEREIIIRRFIDTIREREIDIIVTYNGDNFDFPYLKERAÆKHRIPVSLGVD
GSPLRLERRGMNLGARVTGRPHIDMYPVCRQIFNLSRYTLEDVYLEITGREKKDIRVGEM
AGIWDNPEKEKFKELIEYAMSDAESTLEIAITLLPLHYEISRITRELIYQSSRAGSGQRV
ESLLIKKAFEKSILVPNRPSDRVVNERQRKTYIGAYVVEPKRGIHDNILLDFR**SAGS**I
IISHNIDPSTIDCECCPEDSYRSPTGHYFCKKKRGLIPETLNELVQRRIEVKKGLKNEKN
PERRRFLDVKQQ**SL**KLLANSYGYFGFPRARWY**LE**CAESITALGRKY**HL**HTIDIVPKFG
FDVIYGD TDSVYLIKPNITDRERVMKNAEHFLDKINSELPEAMELEFEGFYPRGIFITKK
RYALIDERGKLIVKGLETKRRDWANIAKDTQEKVLDALLKDNPEKAASIVKDVIRNIKT
GKIPLKDLAINTQITRGMAEYKTEGPHIVAACKAMKRGLEFKQGNIVTYVVTKKGKSISD
KARVIDFVEEGDYDPDYINNQLPSVLRILEALGYSEDELKGLGKQMKLGGF

FIG. 45

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Mutant DNA polymerase from Candidatus altiarthaeales archaeon (SEQ ID NO:223)

MKKTLLDADYITREEKAVVRLFYKTEEGREIQEVADFRPYMYVLPEEHDLLKKLQREIKEL
KNITNVEIKRMIEGDREVEVLKVMVNQPRDVPNLRGLIKELEGCKEVREAHIPFAERYLI
DSGLIPMQDCENFDLRIAAF**AM**AVYNPRGEPKAERDPIIIISYADNRGLRRVWVTKTVEN
LNLDYMEVLKDEREIIIRRFIDTIREREIDIIVTYNGDNFDFPYLKERAEKHRIPVSLGVD
GSPLRLERRGMNLGARVTGRPHIDMYPVCRQIFNLSRYTLEDVYLEITGREKKDIRVGEM
AGIWDNPEKEKFKELIEYAMSDAESTLEIAITLLPLHYEISRITRELIYQSSRAGSGQRV
ESLLIKKAFEKSILVPNRPSDRVVNERQRKTYIGAYVVEPKRGIHDNILLDFDRS**SAGSI**
IISHNIDPSTIDCECCPEDSYRSPTGHYFCKKKRGLIPETLNELVQRRIEVKKGLKNEKN
PERRRFLDVKQQ**SL**KLLANSMYGYFGFPRARWYC**LE**CAESITALGRKY**HL**HTIDIVPKFG
FDVIYGDTSVYLIKPNITDRERV**MD**AEHFLDKINSELPEAMELEFEGFYPRGIFITKK
RYALIDERGKLIVKGLETKRRDWANIAKDTQEKVLDALLKDKNPEKAASIVKDVIRNIKT
GKIPLKDLAINTQITRGMAEYKTEGPHIVAACKAMKRGLEFKQGNIVTYVVTKKGKSISD
KARVIDFVEEGDYDPDYINNQLPSVLRILEALGYSEDELKGLGKQMKLGGF

FIG. 46**Mutant DNA polymerase from Candidatus altiarthaeales archaeon (SEQ ID NO:224)**

MKKTLLDADYITREEKAVVRLFYKTEEGREIQEVADFRPYMYVLPEEHDLLKKLQREIKEL
KNITNVEIKRMIEGDREVEVLKVMVNQPRDVPNLRGLIKELEGCKEVREAHIPFAERYLI
DSGLIPMQDCENFDLRIAAF**AM**AVYNPRGEPKAERDPIIIISYADNRGLRRVWVTKTVEN
LNLDYMEVLKDEREIIIRRFIDTIREREIDIIVTYNGDNFDFPYLKERAEKHRIPVSLGVD
GSPLRLERRGMNLGARVTGRPHIDMYPVCRQIFNLSRYTLEDVYLEITGREKKDIRVGEM
AGIWDNPEKEKFKELIEYAMSDAESTLEIAITLLPLHYEISRITRELIYQSSRAGSGQRV
ESLLIKKAFEKSILVPNRPSDRVVNERQRKTYIGAYVVEPKRGIHDNILLDFDRS**FAGSI**
IISHNIDPSTIDCECCPEDSYRSPTGHYFCKKKRGLIPETLNELVQRRIEVKKGLKNEKN
PERRRFLDVKQQ**SL**KLLANSMYGYFGFPRARWYC**LE**CAESITALGRKY**HL**HTIDIVPKFG
FDVIYGDTSVYLIKPNITDRERV**MD**AEHFLDKINSELPEAMELEFEGFYPRGIFITKK
RYALIDERGKLIVKGLETKRRDWANIAKDTQEKVLDALLKDKNPEKAASIVKDVIRNIKT
GKIPLKDLAINTQITRGMAEYKTEGPHIVAACKAMKRGLEFKQGNIVTYVVTKKGKSISD
KARVIDFVEEGDYDPDYINNQLPSVLRILEALGYSEDELKGLGKQMKLGGF

FIG. 47

Mutant DNA polymerase from Candidatus altiarthaeales archaeon (SEQ ID NO:225)

MKKTLLDADYITREEKAVVRLFYKTEEGREIQEVADFRPYMYVLPEEHDLLKKLQREIKEL
KNITNVEIKRMIEGDREVEVLKVMVNQPRDVPNLRGLIKELEGCKEVREAHIPFAERYLI
DSGLIPMQDCENFDLRIAFA**MA**VYNPRGEPKAERDPIIIISYADNRGLRRVWTYKTVEN
LNLDYMEVLKDEREIIRRFIDTIREREIDIIVTYNGDNFDFPYLKERAEKHRIPVSLGVD
GSPLRLERRGMNLGARVTGRPHIDMYPVCRQIFNLSRYTLEDVYLEITGREKKDIRVGEM
AGIWDNPEKEKFKELIEYAMSDAESTLEIAITLLPLHYEISRITRELIYQSSRAGSGQRV
ESLLIKKAFKESILVPNRPSDRVVNERQRKTYIGAYVVEPKRGIHDNILLFDFRS**YAG**SI
IISHNIDPSTIDCECCPEDSYRSPTGHYFCKKKRGLIPETLNELVQRRIEVKKGLKNEKN
PERRRFLDVKQ**Q**SLKLLANSMYGYFGFPRARWYC**LE**CAESITALGRKY**HL**LHTIDIVPKFG
FDVIYGDTSVYLIKPNITDRERVMK**DA**EHFLDKINSELPEAMELEFEGFYPRGIFITKK
RYALIDERGKLIVKGLETKRRDWANIAKDTQEKVLDALLKDNPEKAASIVKDVIRNIKT
GKIPLKDLAINTQITRMAEYKTEGPHIVAACKAMKRGLEFKQGNIVTYVVTKKGKSISD
KARVIDFVEEGDYDPDYINNQVLPVSLRILEALGYSEDELKGLGKQMKLGGF

FIG. 48**9°N polymerase (SEQ ID NO:226)**

MILDTDYITENGKPVIRVFKKENGEFKIEYDRTFEPYFYALLKDDSAIEDVKKVTAKRHG
TVVKVKRAEKVQKKFLGRPIEVWKLYFNHPQDVPDIRAHPAVVDIYEYDIPFAKRY
LIDKGLIPAEGDEELTMLAFDIETLYHEGEEFGTGPILMISYADGSEARVITWKKIDL
PYVDVSTEKEMIKRFLRVVREKDPDVLITYNGDNFDFAYLKKRCEELGIKFTLGRDGSEPK
IQRMGDRFAVEVKGRIFDLYPVIRRTINLPTYTLEAVYEAVFGKPKEKVYAEIEAQAW
ESGGLERVARYSMEDAKVTYELGREFFPMEAQLSRLIGQSLWDVSRSTGNLVEWFLLRK
AYKRNELAPNKPDERELARRRGYAGGYVKEPERGLWDNIVYLDFRSLYPSIIITHNVSP
DTLNREGCKEYDVAPEVGHKFCKDFPGFIPSLLDLLEERQKIKRKMATVDPLEKKLLD
YRQRAIKILANSFYGYGYAKARWYCKECAESVTAWGREYIEMVIRELEEKFGFKVLYAD
TDGLHATIPGADAETVKKKAKEFLKYINPKLPGLLELEYEGFYVRGFFVTKKKYAVIDEE
GKITTRGLEIVRRDWSEIAKETQARVLEAILKHGDVEEAVRIVKEVTEKLSKYEVPPEKL
VIHEQITRDLRDYKATGPHVAVAKRLAARGVKIRPGTVISYIVLKSGSRIGDRAIPADEF
DPTKHRYDAEYYIENQVLPAPERILKAFGYRKEDLRYQKTKQVGLGAWLKVKGKK

FIG. 49

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9°N polymerase UniProtKB - Q56366 (DPOL_THES9) (SEQ ID NO:227)

MILDTDYITENGKPVIRVFKKENGEFKIEYDRTFEPYFYALLKDDSAIEDVKKVTAKRHG
TVVKVKRAEKVQKKFLGRPIEVWKLYFNHPQDVP AIRDRIRAHPAVVDIYEYDIPFAKRY
LIDKGLIPMEGDEELTMLAFDIETLYHEGEEFGTGPILMISYADGSEARVITWKKIDL PY
VDVNSTEKEMIKRFLRVVREKDPDLITYNGDNFDFAYLKKRCEELGIKFTLGRDGSEPK
IQRMGDRFAVEVKGRIFDLYPVIRRTINLPTYTLEAVYEAVFGKPKEKVYAE EIAQAW E
SGEGLERVARYSMEDAKVTYELGREFFPMEAQLSRLIGQSLWDVSRSTGNLVEWFLLRK
AYKRNELAPNKPDERELARRRGYAGGYVKEPERGLWDNIVYLDFRSLYPSIIITHNVSP
DTLNREGCKEYDVAPEVGHKFCKDFPGFIPSL LGDLLEERQKIKRKM KATVDPLEKKLLD
YRQRAIKILANSFYGYGYAKARWYCKECAESVTAWGREYIEMVIRELEEKFGFKVLYAD
TDGLHATIPGADAETVKKKAKEFLKYINPKLPGLLELEYEGFYVRGFFVTKKKYAVIDEE
GKITTRGLEIVRRDWSEIAKETQARVLEAILKHGDVEEAVRIVKEVTEKLSKYEVPPPEKL
VIHEQITRDLRDYKATGPHVAVAKRLAARGVKIRPGTVISYIVLKGSGRIGDRAIPADEF
DPTKHRYDAEYYIENQVLP AVERILKAFGYRKEDLRYQKTKQVGLGAWLKVKGKK

FIG. 50

Therminator polymerase (SEQ ID NO:228)

MILDTDYITENGKPVIRVFKKENGEFKIEYDRTFEPYFYALLKDDSAIEDVKKVTAKRHG
TVVKVKRAEKVQKKFLGRPIEVWKLYFNHPQDVP AIRDRIRAHPAVVDIYEYDIPFAKRY
LIDKGLIPAEGDEELTMLAFAIATLYHEGEEFGTGPILMISYADGSEARVITWKKIDL PY
VDVNSTEKEMIKRFLRVVREKDPDLITYNGDNFDFAYLKKRCEELGIKFTLGRDGSEPK
IQRMGDRFAVEVKGRIFDLYPVIRRTINLPTYTLEAVYEAVFGKPKEKVYAE EIAQAW E
SGEGLERVARYSMEDAKVTYELGREFFPMEAQLSRLIGQSLWDVSRSTGNLVEWFLLRK
AYKRNELAPNKPDERELARRRGYAGGYVKEPERGLWDNIVYLDFRSLYPSIIITHNVSP
DTLNREGCKEYDVAPEVGHKFCKDFPGFIPSL LGDLLEERQKIKRKM KATVDPLEKKLLD
YRQRLIKILANSFYGYGYAKARWYCKECAESVTAWGREYIEMVIRELEEKFGFKVLYAD
TDGLHATIPGADAETVKKKAKEFLKYINPKLPGLLELEYEGFYVRGFFVTKKKYAVIDEE
GKITTRGLEIVRRDWSEIAKETQARVLEAILKHGDVEEAVRIVKEVTEKLSKYEVPPPEKL
VIHEQITRDLRDYKATGPHVAVAKRLAARGVKIRPGTVISYIVLKGSGRIGDRAIPADEF
DPTKHRYDAEYYIENQVLP AVERILKAFGYRKEDLRYQKTKQVGLGAWLKVKGKK

FIG. 51

Vent polymerase UniProtKB - P30317(DPOL_THELI) (SEQ ID NO:229)

MILDTDYITKDGKPIIRIFKKENGFEFKIELDPHFQPYIYALLKDDSAIEEIKAIKGERHG
KTVRVLDVAVKVRKKFLGREVEVWKLIFEHPQDVPAMRGKIREHPAVVDIYEYDIPFAKRY
LIDKGLIPMEGDEELKLLAFDIETFYHEGDEFGKGEIIMISYADEEEARVITWKNIDL
PYVDVVSNEREMIKRFVQVVEKDPDVIITYNGDNFDLPYLIKRAEKLGVRLVLGRDKEHPE
PKIQRMGDSFAVEIKGRIHFDLFPVVRRTINLPTYTLEAVYEAVLGKTKSKLGAEIIAAI
WETEESMKKLAQYSMEDARATYELGKEFFPMEAEALAKLIGQSVWDVSRSSSTGNLVEWYLL
RVAYARNELAPNKPDEEEYKRRRLRTTYLGGYVKEPEKGLWENIIYLDFRSLYPSIIIVTHN
VSPDTLEKEGCKNYDVAPIVG YR FCKDFPGFIP SILGDLIAMRQDIKKMKSTIDPIEKK
MLDYRQRAIKLLANSILPNEWLP I IENGEIKFVKIGEFINSYMEKQKENVKTVENTEVLE
VNNLFAFSFNKKIKESVKKVKALIRHKYKGKAYEIQLSGRKINITAGHSLFTVRNGEI
KEVSGDGIKEGDLIVAPKKIKLNEKGV SINIPELISDLSEETADIVMTISAKGRKNFFK
GMLRTL RWMFGEENRRIRTFNRYLFHLEKLGLIKLLPRGYEVTDWERLKKYKQLYEKL
AGSVKYNGNKREYLVMFNEIKDFISYFPQKELEEWKIGTLNGFRTNCILKVEDDFGKLLGY
YVSEGYAGAQNKTGGISYSVKLYNEDPNVLESMKNVAEKFFGKVRVDRNCVSISSK MAYL
VMKCLCGALAENKRIPSVILTSPEPV RWSFLEAYFTGDGDIHPSKRFR LSTKSELLANQL
VFLNLSLGISSVKIGFDSGVYRVYINEDLQFPQTSREKNTYYSNLIPKEILRDVFGKEFQ
KNMTFKKFELVDSGKLNREKAKLLEFFINGDIVLDRVKSVEKDYEGYVYDLSVEDNEN
FLVGFGLLYAHNSYYGYMGYPKARWYSKECAESVTAWGRHYIEMTIREIEEKFGFKVLYA
DSVSGESEIIIRQNGKIRFVKIKDLFSKVDYSIGEKEYCILEGVEALTLDGGLVWKPV
PYVMRHRANKRMFRIWLTNSWYIDVTEDHSLIGYLNSTKTAKKIGERLKEVKPPELFGK
AVKSLICPNAPLKDENTKTSEIAVKFWELVGLIVGDGNWGGDSRWAEYYLGLSTGKDAEE
IKQKLEPLKTYGVISNYYPKNEKGDFNILAKSLVKFMKRHFKDEKGRRKIPEFMYELPV
TYIEAFLRGLFSADGTVTIRKGVPEIRLTNIDADFLREVRKLLWIVGISNSIFAETTPNR
YNGVSTGTYSKHLRIKNKWRFAERIGFLIERKQKRLLLEHLKSARVKRNTIDFGFDLVHV
KVEEIPYEGYVDIEVEETHRFFANNILVHNTDGFYATIPGEKPELIKKAKEFLNYINS
KLPGLELEYEGFYLRGFFVTKKRYAVIDEEGRITTRGLEVVRRDWSEIAKETQAKVLEA
ILKEGSVEKAVEVVRDVVEKIAKYRVPLEKLV IHEQITRDLKDYKAIGPHVAIAKRLAAR
GIKVKPGTIIISYIVLKGSGKISDRVILLTEYDPRKHKYDPDYIENQVLPVLRILEAFG
YRKEDLRYQSSKQTGLDAWLKR

FIG. 52

Deep Vent polymerase UniProtKB - Q51334 (DPOL_PYRSD) (SEQ ID NO:230)

MILDADYITEDGKPIIRIFKKENGFEKVEYDRNFRPYIYALLKDDSQIDEVRKITAERHG
KIVRIIDAEKVRKKFLGRPIEVWRLYFEHPQDVPARDKIREHSAVIDIFEYDIPFAKRY
LIDKGLIPMEGDEELKLLAFDIETLYHEGEEFAKGPIIMISYADEEEAKVITWKIDLPY
VEVVSSEMIKRFLLKVIKREKDPDVIITYNGDSFDLPYLVKRAEKLGIKLPGRDGSEPK
MQRLGDMTAVEIKGRIHFDLYHVIRRTINLPTYTLEAVYEAI FGKPKKQVYAHEIAEAW
TGKGLERVAKYSMEDAKVTYELGREFFPMEAQLSRLVGQPLWDVSRSTGNLVEWYLLRK
AYERNELAPNKPDEREYERRLRESYAGGYVKEPEKGLWEGLVSLDFRSLYPSIIITHNVS
PDTLNREGCREYDVAPEVGHKFKCDPFGFIPSLKRLDERQEIKRKMASKDPIEKKML
DYRQRAIKILANSILPEEWVPLIKNGKVKI FRIGDFVDGLMKANQGKVKKTGDTEVLEVA
GIHAFSFDKRSKKARVMKAVIRHRYSGNVYRIVLNSGRKITITEGHSLFVYRNGDLVE
ATGEDVKIGDLLAVPRSVNLPEKRERLNIVELLLNLSPEETEDIILTIPVKGRKNFFKGM
LRTLRFWIFGEEKRVRTASRYLRHLENLGYIRLRKIGYDIIDKEGLEKYRTLYEKLVDVVR
YNGNKREYLVEFNAVRDVISLMPPEELKEWRIGTRNGFRMGTFVDIDEDFAKLLGYVSE
GSARKWKNQTTGGWSYTVRLYNENDEVLLDMEHLAKKFFGKVKRGKNYVEIPKKMAYIIIFE
SLCGTLAENKRVPEVIFTSSKGVWAFLEGYFIGDGDVHPSKRVRLSTKSELLVNGLVLL
LNSLGVSAIKLGYDSGVYRVYVNEELKFTEYRKKKNVYHSHIVPKDILKETFGKVFQKNI
SYKKFRELVENGLDREKAKRIEWLLNGDIVLDRVVEIKREYYDGYVYDLSVDEENFLA
GFGFLYAHNSYYGYGYAKARWYCKECAESVTAWGREYIEFVRKELEEKFGFKVLYIDTD
GLYATIPGAKPEEIKKKALEFVDYINAKLPGLLELEYEGFYVRGFFVTKKKYALIDEEGK
IITRGLEIVRRDWSEIAKETQAKVLEAILKHGNVEEAVKIVKEVTEKLSKYEIPPEKLV
YEQITRPLHEYKAIGPHVAVAKRLAARGVKVRPGMVIGYIVLRGDGPISKRAILAEEDL
RKHKYDAEYYIENQVLPVLRILEAFGYRKEDLRWQTKQTGLTAWLNKIKK

FIG. 53**Pfu polymerase UniProtKB - P61875 (DPOL_PYRFU) (SEQ ID NO:231)**

MILDVDYITEEGKPVIRLFKKENGKFKIEHRTFRPYIYALLRDDSKIEEVKKITGERHG
KIVRIVDVEKVEKKFLGKPITVWKLYLEHPQDVPTIREKVRHAPAVVDIFEYDIPFAKRY
LIDKGLIPMEGEEELKILAFDIETLYHEGEEFGKGPIIMISYADENEAKVITWKNIIDLPY
VEVVSSEMIKRFLLRIIREKDPDIIVTYNGDSFDFPYLAKRAEKLGIKLTIGRDGSEPK
MQRIGDMTAVEVKGRIHFDLYHVITRTINLPTYTLEAVYEAI FGKPKKQVYADEIAKAW
SGENLERVAKYSMEDAKATYELGKEFLPMEIQLSRLVGQPLWDVSRSTGNLVEWFLLRK
AYERNEVAPNKPSEEEYQRRRLRESYTGGFVKEPEKGLWENIVYLDLFRALYPSIIITHNVS
PDTLNLEGCKNYDIAPQVGHKFKCDIPFGFIPSLGHLLERQKIKTMMKETQDPIEKILL
DYRQKAIKLLANSFYGYGYAKARWYCKECAESVTAWGRKYIELVWKELEEKFGFKVLYI
DTDGLYATIPGGESEEIKKKALEFVKYINSKLPGLLELEYEGFYKRGFFVTKKRYAVIDE
EGKVIITRGLEIVRRDWSEIAKETQARVLETILKHGDVEEAVRIVKEVIQKLANYEIPPEK
LAIYEQITRPLHEYKAIGPHVAVAKKLAAGVKIKPGMVIGYIVLRGDGPISNRILAEE
YDPKKHKYDAEYYIENQVLPVLRILEGFGYRKEDLRQYQTRQVGLTSWLNKIKS

FIG. 54

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Pyrococcus abyssi polymerase UniProtKB - P0CL77 (DPOL_PYRAB) (SEQ ID NO:232)

MIIDADYITEDGKPIIRIFKKEKGFEKVEYDRTFRPYIYALLKDDSAIDVKKITAERHG
KIVRITEVEKVQKKFLGRPIEVWKLYLEHPQDVPAIREKIREHPAVVDIFEYDIPFAKRY
LIDKGLTPMEGNEELTFLAVDIETLYHEGEEFGKGPIIMISYADEEGAKVITWKSIDL
PYVEVVSSSEREMIKRLVKVIREKDPDVIIITYNGDNFDFPYLLKRAEKLGIKLPLGRDNSEPK
MQRMGDSLAVEIKGRIHFDLFPVIRRTINLPTYTLEAVYEAFGKSKEKVYAHEIAEAW
ETGKGLERVAKYSMEDAKVTFELGKEFFPMEAQLARLVGQPVWDVSRSTGNLVEWFLLRK
AYERNELAPNKPDEREYERRLRRESYEGGYVKEPEKGLWEGIVSLDFRSLYPSIIITHNVS
PDTLNRENCKEYDVAPQVGHRFCKDFPGFIPSLGNLLEERQKIKKRMKESKDPVEKKLL
DYRQRAIKILANSYYGYGYAKARWYCKECAESVTAWGRQYIDLVRRELESRGFKVLYID
TDGLYATIPGAKHEEIKEKALKFVEYINSKLPGLLELEYEGFYARGFFVTKKKYALIDEE
GKIVTRGLEIVRRDWSEIAKETQAKVLEAILKHGNVDEAVKIVKEVTEKLSKYEIPPEKL
VIYEQITRPLSEYKAIGPHVAVAKRLAAKGVKVKPGMVIGYIVLRGDGPISKRAIAIEEF
DPKKHKYDAEYYIENQVLPAPERILRAFGRKEDLKYQKTKQVGLGAWLKF

FIG. 55**RB69 polymerase UniProtKB - Q38087 (DPOL_BPR69) (SEQ ID NO:233)**

MKEFYLTVEQIGDSIFERYIDSNGRERTREVEYKPSLFAHCPESQATKYFDIYGKPCTRK
LFANMRDASQWIKRMEDIGLEALGMDDFKLAYLSDTYNIEIKYDHTKIRVANFDIEVTSP
DGFPEPSQAKHPIDAITHYDSIDDRFYVFDLLNSPYGNVEEWSIEIAAKLQEQQGDEVPS
EIIDKIIYMPFDNEKELLMEYLNFWQQKTPVILTGWNVESFDIPYVYNRIKNIFGESTAK
RLSPHRKTRVKVIENMYGSREIITLFGISVLDYIDLYKKFSFTNQPSYSLDYISEFELNV
GKLKYDGPISKLRESNHQRYISYNIIDVYRVLQIDAKRQFINLSLDMGYAKIQIQSVFS
PIKTWDALIFNSLKEQNKVIPQGRSHPVQPYPGAFVKEPIPNRYKYVMSFDLTSLYPSII
RQVNI SPETIAGTFKVAPLHDYINAVAERP SDVYSCSPNGMMYYKDRDGVVPTEITKVFN
QRKEHKGYMLAAQRNGEIIKEALHNPNLSVDEPLDVDYRFD FSDEIKEIKKLSAKSLNE
MLFRAQRTEVAGMTAQINRKLLINSLYGALGNVWFRYYDLRNATAITTFGQMALQWIERK
VNEYLNVEVCGETEGEAFVLYGDTDSIYVSADKIIDKVGESKFRDTNHWVDFLDKFARERME
PAIDRGFREMCEYMNNKQHLMFMDREAIAGPPLGSKGIGGFWTGKKRYALNVWDMEGTRY
AEPKLKIMGLETQKSSTPKAVQKALKECIRRMLQEGEESLQEYFKEFEKEFRQLNYISIA
SVSSANNIAKYDVGGFPGPKCPFHIRGILTYNRAIKGNIDAPQVVEGEKVYVLPPLREGNP
FGDKCIAWPSGTEITDLIKDDVLHWM DYTVLLEKTFIKPLEGFTSAAKLDYEKKASLFD
M FDF

FIG. 56