

FIG. 1

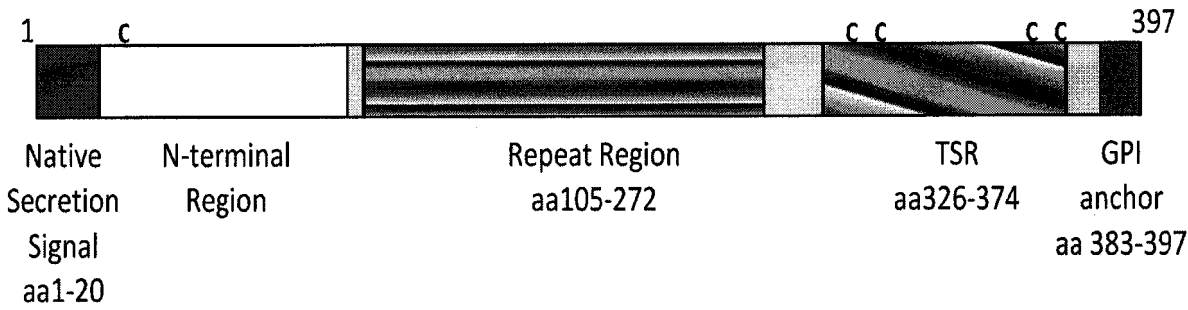


FIG. 2A**A. *P. falciparum* 3D7 CS protein Genbank entry CAB38998 (SEQ ID NO: 1)**

predicted signal peptide
 ~~~~~

1 MMRKLAILSV SSFLFVEALF QEYQCYGSSS NTRVLNELNY DNAGTNLYNE  
 51 LEMNYYGKQE NWYSLKKNSR SLGENDDGNN EDNEKLRKPK HKKCLKQPADG  
 101 NPDNPANPNV DPNANPNVDP NANPNVDPNA NPNANPNANP NANPNANPNA  
 151 NPNANPNANP NANPNANPNA NPNANPNANP NANPNANPNA NPNANPNVDP  
 201 NANPNANPNA NPNANPNANP NANPNANPNA NPNANPNANP NANPNANPNA  
 251 NPNANPNANP NANPNANPNA NPNKNNQGNG QGHNMPNDPN RNVDENANAN  
 Thrombospondin type 1 domain  
 ~~~~~

301 SAVKNNNNEE PSDKHIKEYL NKIQNSLSTE WSPCSVTGNG GIQVRIKPGS
 Thrombospondin type 1 domain putative GPI anchor
 ~~~~~

351 ANKPKDELDY ANDIEKKICK MEKCSSVFNV VNSSIGLIMV LSFLFLN

**FIG. 2B****B. Cytoplasmic CSP (SEQ ID NO: 2):**

1 MQEYQCYGSS SNTRVLNELN YDNAGTNLYN ELEMNYYGKQ ENWYSLKKNS  
 51 RSLGENDDGNN NEDNEKLRKP KHKCLKQPAD GNPDPANPN VDPNANPNVD  
 101 PNANPNVDPN ANPNANPNAN PNANPNANPN ANPNANPNAN PNANPNANPN  
 151 ANPNANPNAN PNANPNANPN ANPNANPNVD PNANPNANPN ANPNANPNAN  
 201 PNANPNANPN ANPNANPNAN PNANPNANPN ANPNANPNAN PNANPNANPN  
 251 ANPNKNNQGN GQGHNMPNDP NRNVDENANA NSAVKNNNNEE EPSDKHIKEY  
 Thrombospondin type 1 domain  
 ~~~~~

301 LNKIQNSLST EWSPCSVTGNG NGIQVRIKPG SANKPKDELD YANDIEKKICK
 Thrombospondin type 1 domain
 ~~~~~

351 KMEKCSSVFNV VVN

**FIG. 2C****C. Periplasmic CSP (SEQ ID NO: 3):**

1 QEYQCYGSSS NTRVLNELNY DNAGTNLYNE LEMNYYGKQE NWYSLKKNSR  
 51 SLGENDDGNN EDNEKLRKPK HKKCLKQPADG NPDNPANPNV DPNANPNVDP  
 101 NANPNVDPNA NPNANPNANP NANPNANPNA NPNANPNANP NANPNANPNA  
 151 NPNANPNANP NANPNANPNA NPNANPNVDP NANPNANPNA NPNANPNANP  
 201 NANPNANPNA NPNANPNANP NANPNANPNA NPNANPNANP NANPNANPNA  
 251 NPNKNNQGNG QGHNMPNDPN RNVDENANAN SAVKNNNNEE PSDKHIKEYL  
 Thrombospondin type 1 domain  
 ~~~~~

301 NKIQNSLSTE WSPCSVTGNG GIQVRIKPGS ANKPKDELDY ANDIEKKICK
 Thrombospondin type 1 domain
 ~~~~~

351 MEKCSSVFNV VN

**FIG. 3A****A. *P. Falciparum* 3D7 CS nucleotide Genbank entry XM\_001351086.1 (SEQ ID NO: 4)**

```

1141 atgatgagaa aattagctat tttatctgtt tcttcctttt tatttggtga ggccttattc
61  caggaatacc agtgctatgg aagttcgtca aacacaaggg ttctaaatga attaaattat
121  gataatgcag gcactaattt atataatgaa ttagaaatga attattatgg gaaacaggaa
181  aattggtata gtcttaaaaa aaatagtaga tcaactggag aaaatgatga tggaaataac
241  gaagacaacg agaaattaag gaaaccaaaa cataaaaaat taaagcaacc agcggatggg
301  aatcctgatc caaatgcaaa cccaaatgta gatcccaatg ccaacccaaa tgtagatcca
361  aatgcaaacc caaatgtaga tccaaatgca aacccaaatg caaacccaaa tgcaaaccce
421  aatgcaaacc caaatgcaaa cccaaatgca aacccaaatg caaacccaaa tgcaaaccce
481  aatgcaaacc caaatgcaaa cccaaatgca aacccaaatg caaacccaaa tgcaaaccce
541  aatgcaaacc ccaatgcaaa tcctaagtga aacccaaatg caaacccaaa cgtagatcct
601  aatgcaaacc caaatgcaaa cccaaacgca aaccccaatg caaatcccaa tgcaaaccce
661  aatgcaaacc ctaatgcaaa tcctaagtgc aatccaaatg caaatcccaa tgcaaaccce
721  aacgcaaacc ccaatgcaaa tcctaagtgc aatccaaatg caaatcccaa tgcaaaccce
781  aatgcaaacc caaatgcaaa ccccaatgca aatccctaata aaaacaatca aggtaattga
841  caaggtcaca atatgccaaa tgacccaaac cgaaatgtag atgaaaatgc taatgccaac
901  agtgctgtaa aaaataataa taacgaagaa ccaagtgata agcacataaa agaataatta
961  aacaaaatac aaaattctct ttcaactgaa tgggtcccat gtagtgtaac ttgtggaaat
1021 ggtattcaag ttagaataaaa gcttggtctt gctaataaac ctaaagacga attagattat
1081 gcaaatgata ttgaaaaaaa aatttgtaaa atggaaaaat gttccagtgt gtttaatgtc
1141 gtaaatagtt caataggatt aataatggta ttatccttct tgttccttaa ttag

```

**FIG. 3B****B. (SEQ ID NO: 5) Optimized CSP Nucleic Acid Sequence 1 Encoding Amino Acid Sequence of Fig. 2C (SEQ ID NO: 3)**

```

1  caggagtatc aatgctatgg tagctcaagc aacacccgcg tcttgaatga gctgaactat
61  gacaacgccg ggacgaacct gtacaacgag ttggagatga actactacgg caaacaggag
121  aactggtact cgcttaagaa gaacagccgg agtctcggtg aaaacgacga tggaaacaac
181  gaggacaacg aaaaactgcg caagccgaaa cataagaaac tgaaacagcc ggctgacggc
241  aacccggacc cgaacgcaaa cccgaacgtg gacccgaatg caaacccgaa tgtggatccc
301  aatgcaaacc cgaatgttga ccccaacgct aacccgaacg cgaatccgaa tgccaaccgg
361  aacgcccaacc ccaacgctaa ccctaacgcc aatccgaacg cgaacccgaa cgctaaccce
421  aatgctaacc ccaacgctaa ccctaacgcc aatccgaacg cgaacccgaa cgctaaccce
481  aacgcgaacc ctaacgctaa cccgaacgcc aacccgaacg ctaatcccaa tgtagacccc
541  aacgcgaacc cgaacgctaa ccctaacgcc aacccgaacg cgaacccgaa cgcgatcccg
601  aacgcccaatc cgaatgcgaa tccaaacgcc aacccgaacg caaacccgaa cgcgatcccg
661  aacgcccaatc ccaatgcgaa ccctaacgcc aatccaaatg caaatccgaa cgcgaccccc
721  aacgcccaatc cgaacgctaa tccgaacgcc aaccccaata agaacaacca aggcacgggc
781  cagggccaca acatgccgaa cgacccaaac cgtaacgtcg atgaaaacgc taatgccaac
841  tccgccgtga agaataacaa taacgaagaa cccagcgaca aacacatcaa agagtacctg
901  aacaagatcc aaaacagtct ctgcaccgaa tgggtcgccct gctccgtgac ctgcgggaac
961  ggtattcagg tgcgcaccaa gcccggcagc gccacaacgc cgaaggatga attggattac
1021 gcgaacgaca tcgaaaagaa gatctgtaag atggagaagt gctccagcgt gttcaacgtc
1081 gtcaac

```

**FIG. 3C**

C. (SEQ ID NO: 6) Optimized CSP Nucleic Acid Sequence 2 Encoding Amino Acid Sequence of Fig. 2C (SEQ ID NO: 3)

```

1   caagaataacc agtggttatgg cagctccagt aacactcgcg tgctcaatga gcttaactat
61  gacaacgcag gcaccaactt gtataacgaa ctggagatga attactacgg taaacaggag
121 aactggtaca gtctgaaaaa gaactcccgt tcactcggcg aaaatgatga cggcaataac
181 gaggataacg aaaagttgcg caagccgaag cataagaaac tgaaacagcc agccgacggc
241 aacccggaac caaatgccaa tccgaacgtg gaccccaacg cgaatccaaa cgtggacccc
301 aacgccaaac ccaacgtgga ccccaacgct aaccccaatg ctaatcccaa tgccaatccc
361 aatgccaatc ccaacgcgaa ccccaacgct aacccgaatg ccaaccccaa cgccaacccg
421 aacgcaaacc cgaacgcgaa cccgaacgct aacccgaatg ccaacccgaa cgccaaccca
481 aacgcaaacc caaatgccaa tcctaacgcc aacccgaacg cgaatcctaa tgtggaccct
541 aatgcgaacc cgaatgcgaa cccgaatgcc aacccgaacg ccaacccgaa cgcaaaccgg
601 aatgcgaacc ctaacgcaaa cccgaatgcg aacccaaacg cgaaccccaa cgcaaaccgg
661 aacgcgaacc cgaacgcgaa ccctaacgct aacccaaacg ccaacccgaa cgccaacccc
721 aacgcgaatc cgaacgcgaa ccctaacgcc aacccgaaca agaataacca aggtaacggg
781 caaggacaca acatgccgaa cgacccgaac cggaacgtcg atgagaacgc caatgcgaac
841 tcggccgtta agaacaacaa caatgaagaa cccagcgata aacacatcaa agaataacctg
901 aacaaaatcc agaattcggt gagcaccgag tggtcgcctt gcagcgttac ctgcgggaac
961 ggcattcagg tccgcaccaa gccgggctcc gccataaagc ccaaggatga gctggactac
1021 gccaacgata tcgagaagaa gatctgcaag atggaaaagt gcagctcggg attcaacgtg
1081 gtcaac

```

FIG. 4A

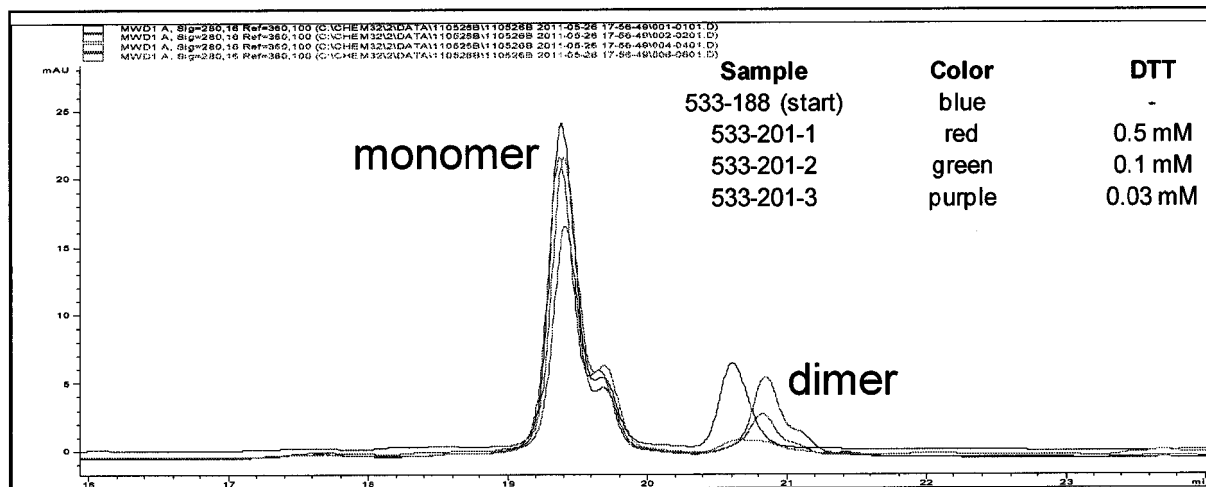
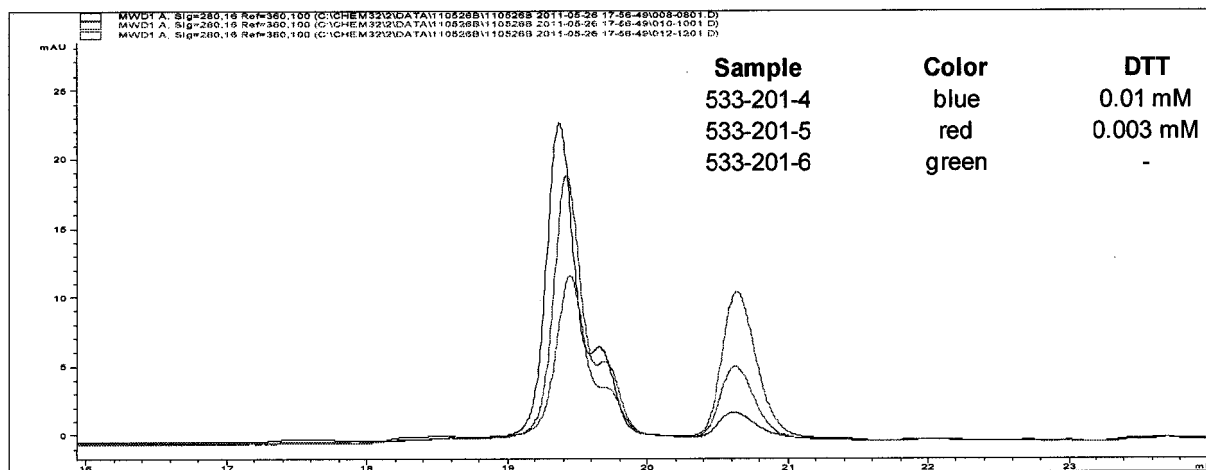


FIG. 4B



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FIG. 5A

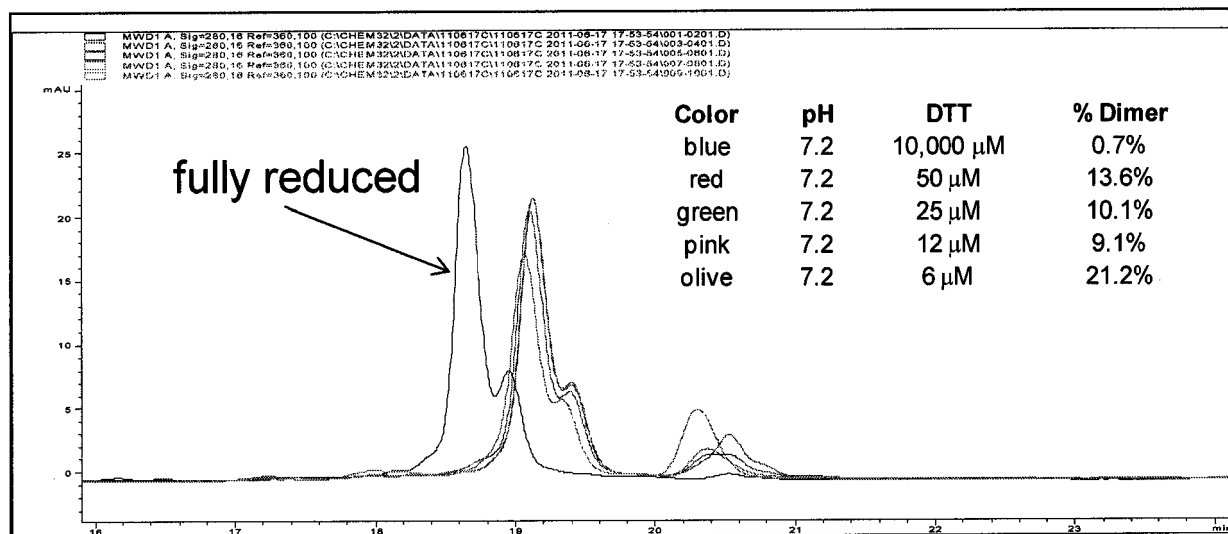


FIG. 5B

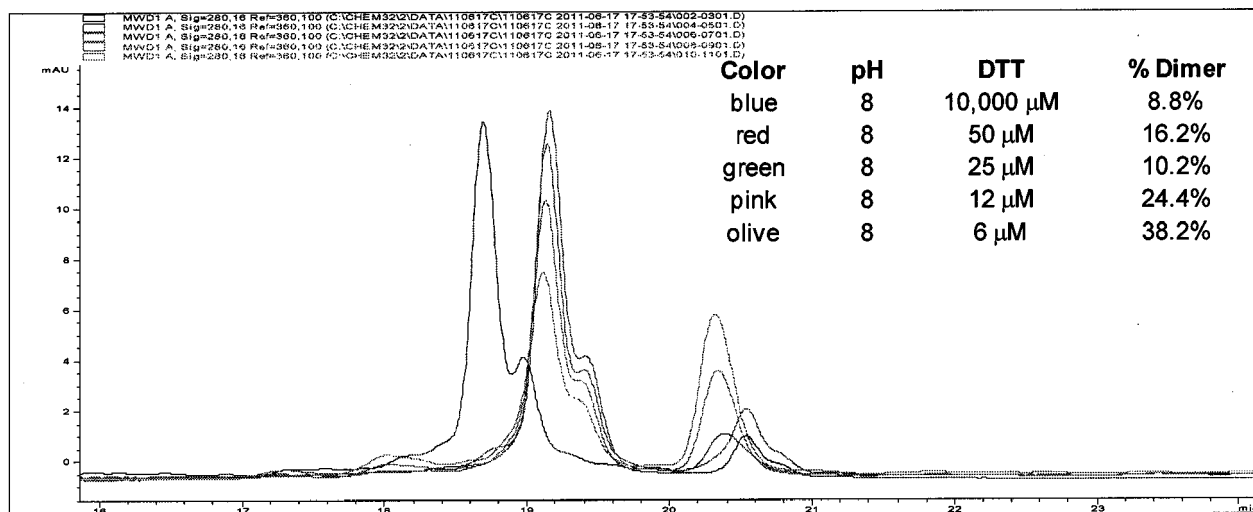


FIG. 6A

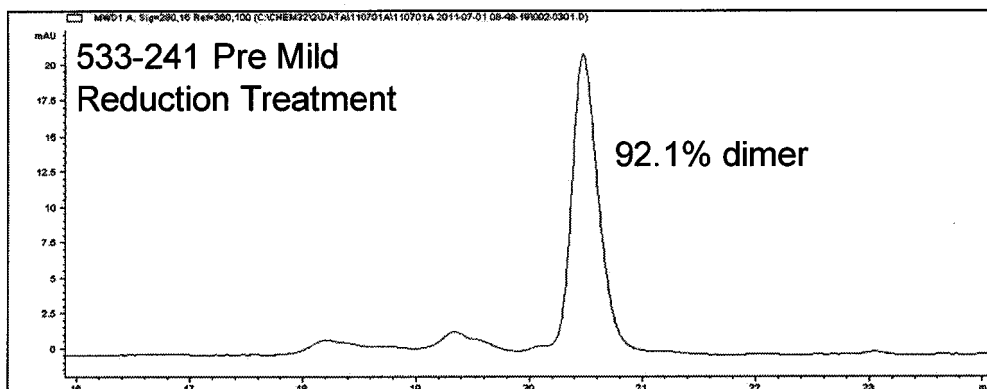


FIG. 6B

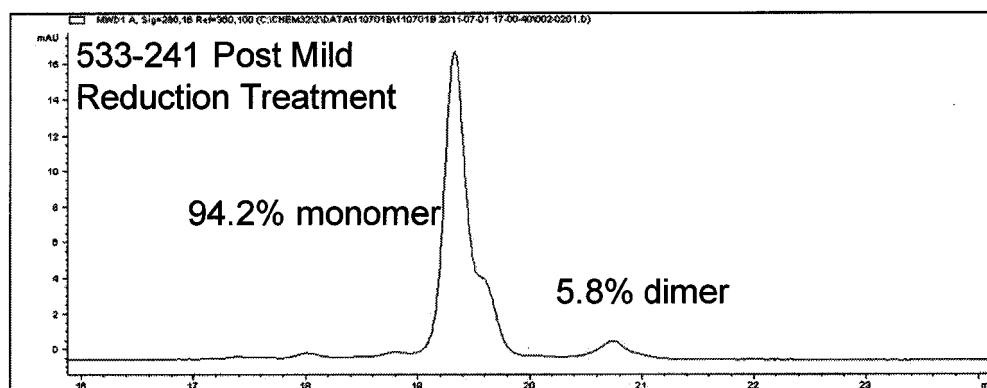


FIG. 6C

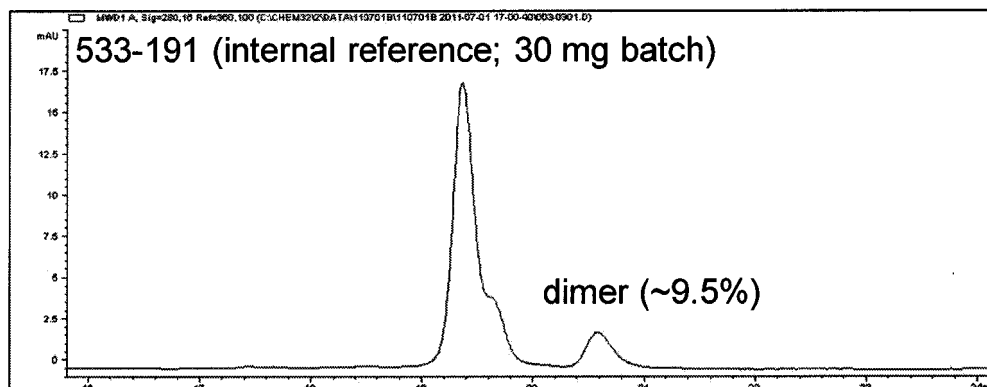


FIG. 7A

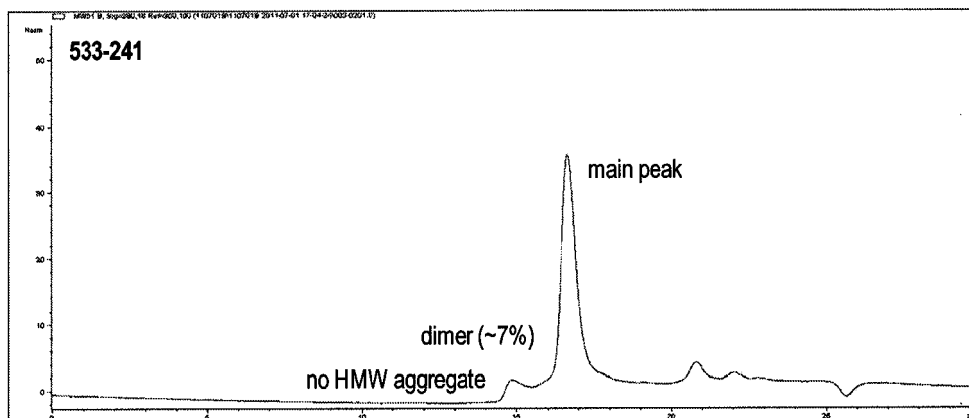


FIG. 7B

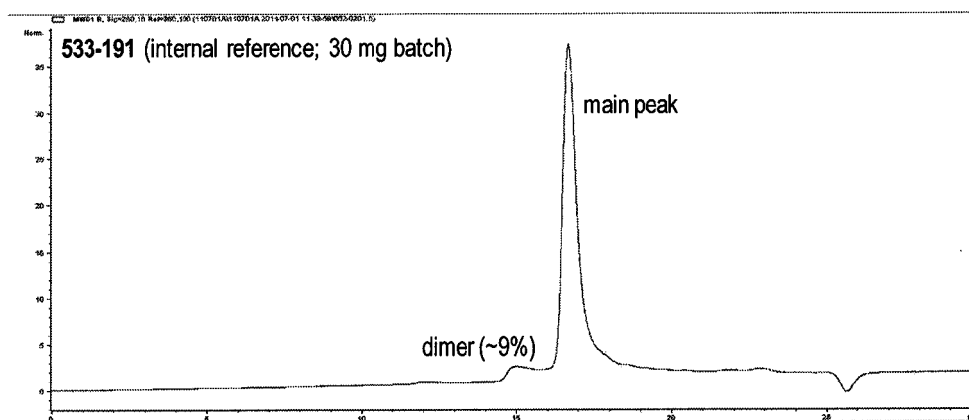


FIG. 8A

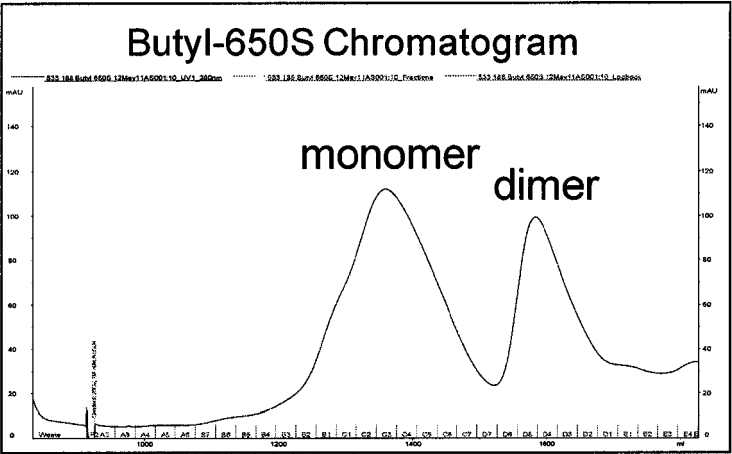


FIG. 8B



FIG. 8C

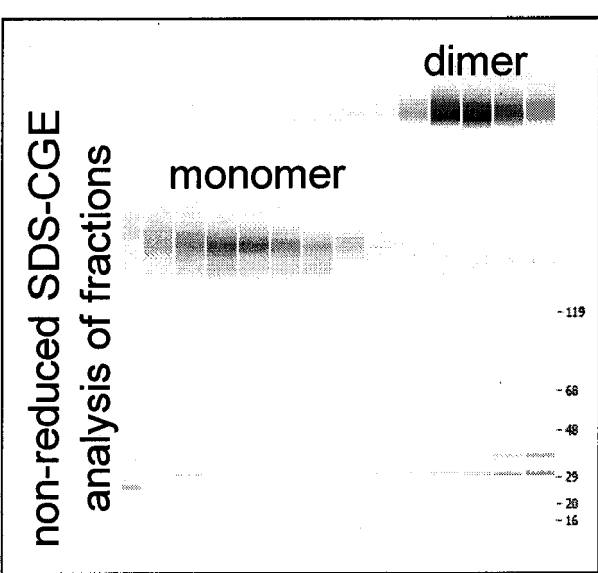
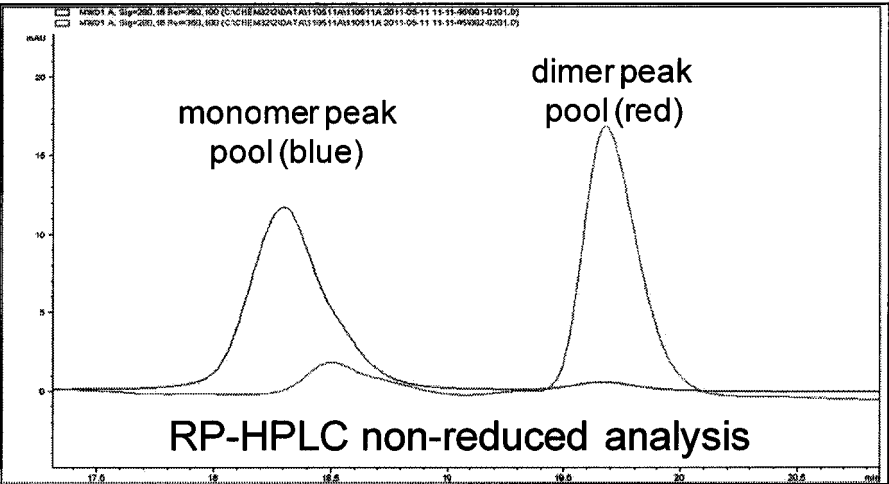


FIG. 8D



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FIG. 9A

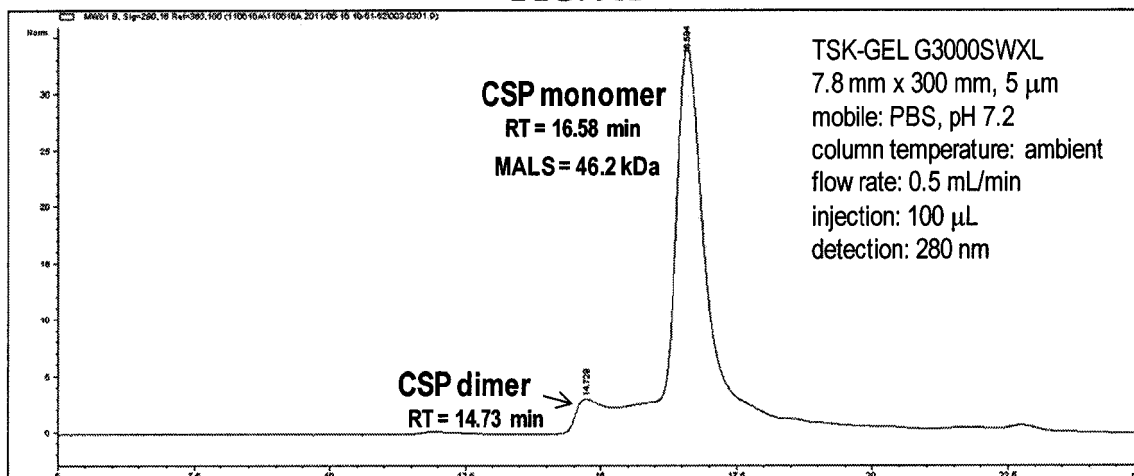


FIG. 9B

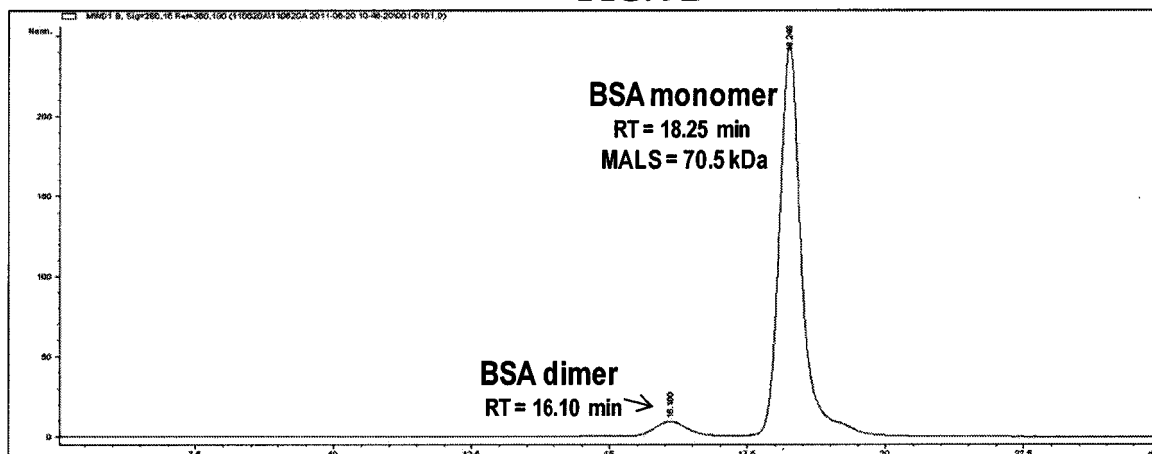


FIG. 10A

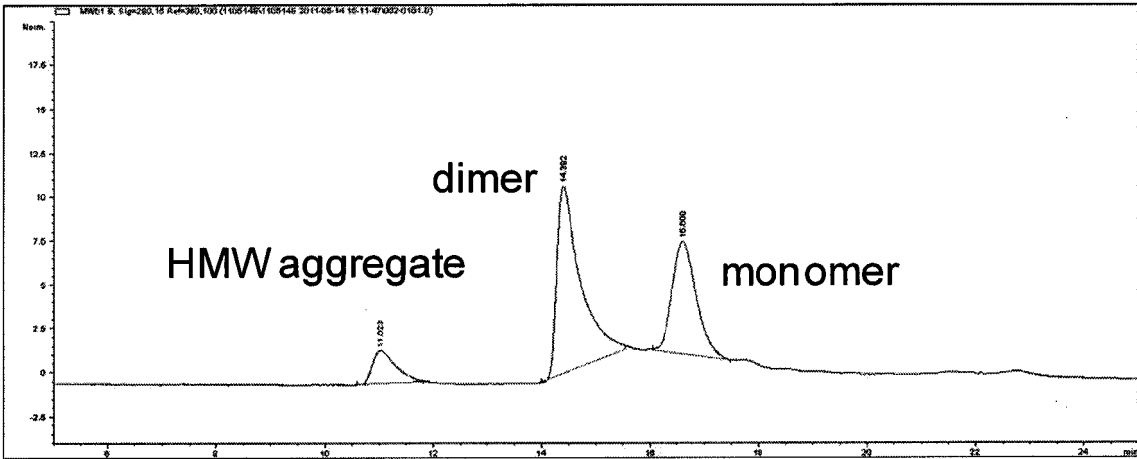
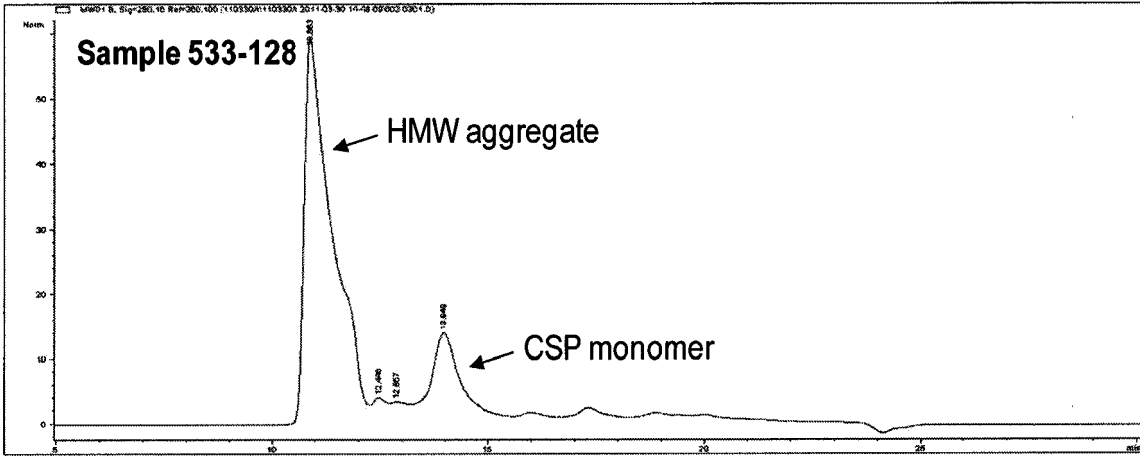


FIG. 10B



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FIG. 11A

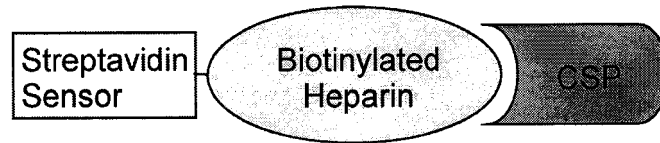


FIG. 11B

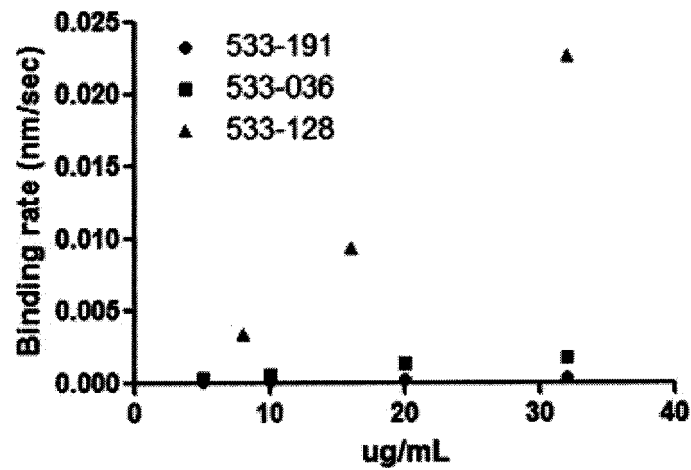


FIG. 11C

Comparison of CSP binding rates

| CSP batch | CSP $\mu\text{g/mL}$ | Binding rate (nm/sec) | StDev    |
|-----------|----------------------|-----------------------|----------|
| 533-036   | 5                    | 3.70E-04              | 1.41E-05 |
|           | 10                   | 7.00E-04              |          |
|           | 20                   | 1.41E-03              | 1.13E-04 |
|           | 32                   | 1.74E-03              | 1.41E-05 |
| 533-191   | 5                    | 1.00E-04              | 2.83E-05 |
|           | 10                   | 1.25E-04              | 2.12E-05 |
|           | 20                   | 2.20E-04              | 5.66E-05 |
|           | 32                   | 3.85E-04              | 6.36E-05 |
| 533-128   | 8                    | 3.39E-03              | 1.84E-04 |
|           | 16                   | 9.38E-03              | 2.12E-04 |
|           | 32                   | 2.27E-02              | 6.36E-05 |

10 mg batch  
[low level of aggregation]

30 mg batch  
[no aggregation]

3 g batch  
[very high aggregation]

FIG. 12A

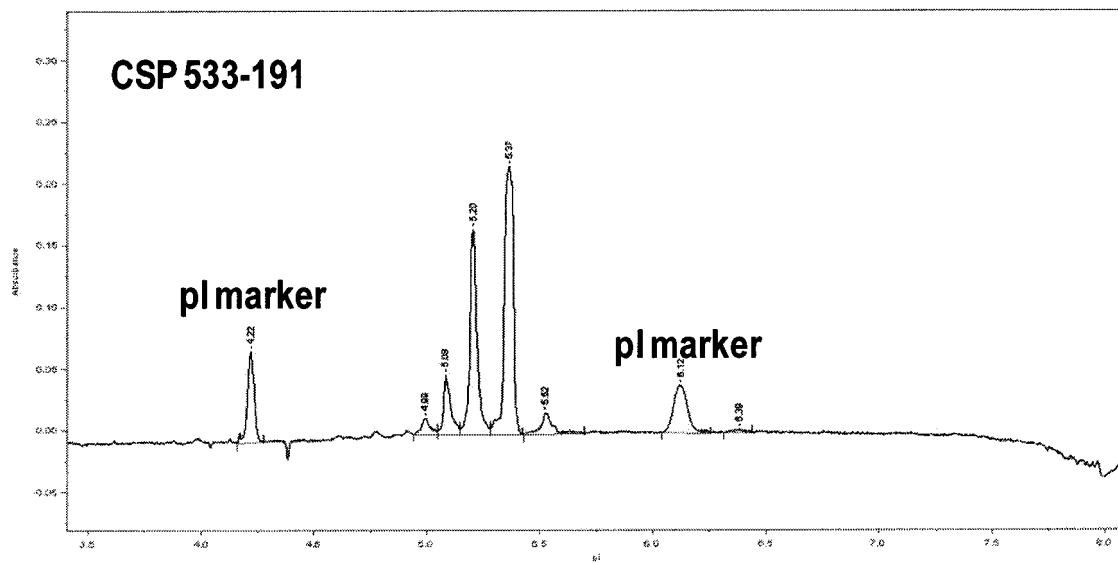


FIG. 12B

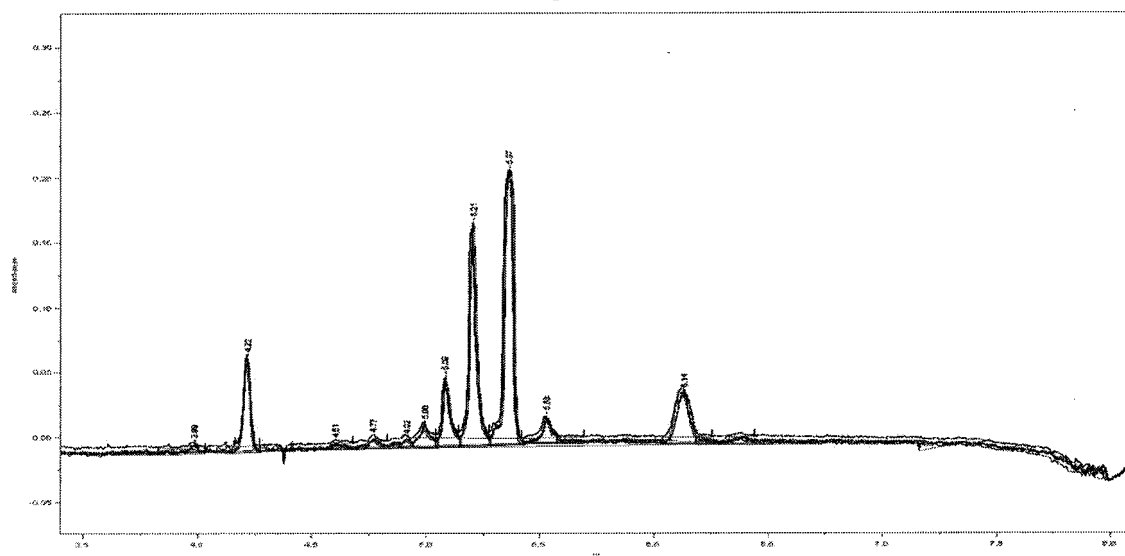


FIG. 13A

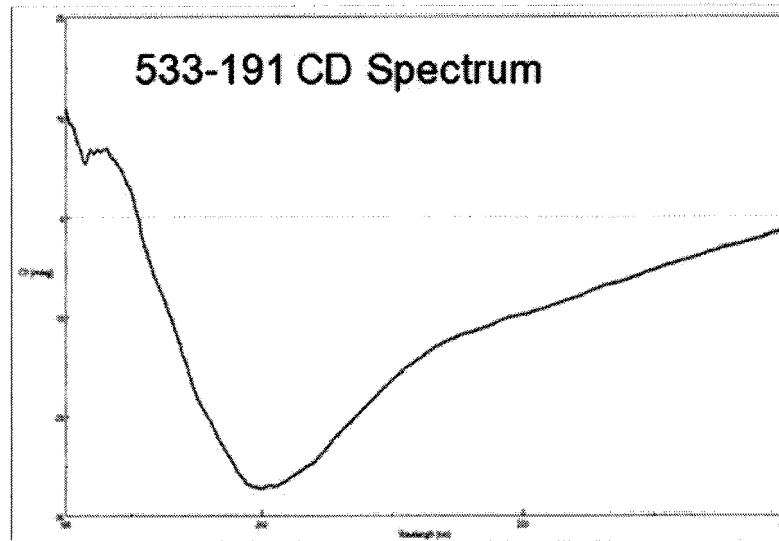
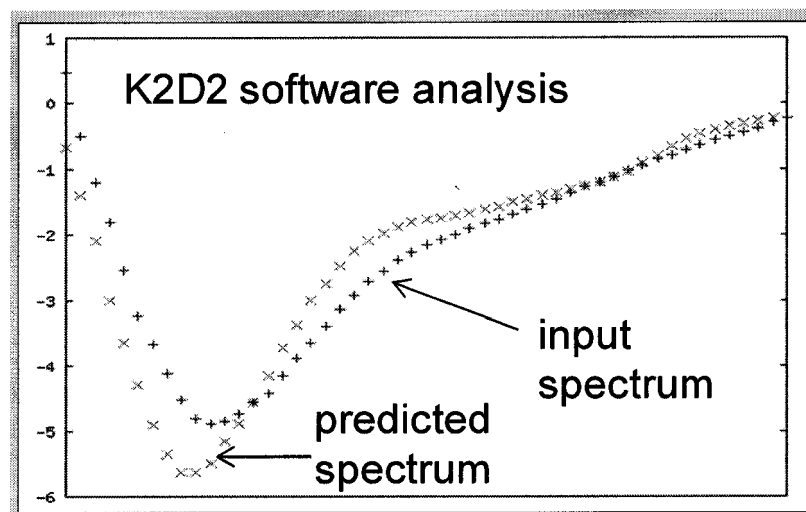
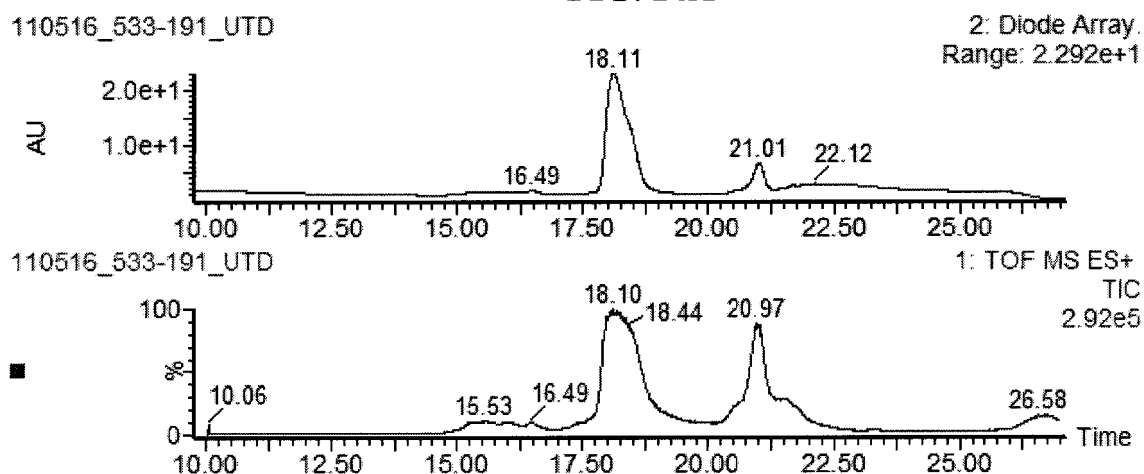
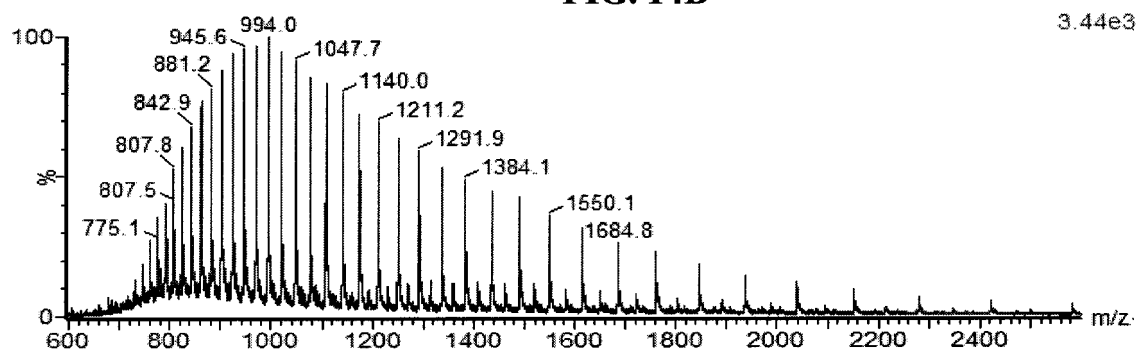
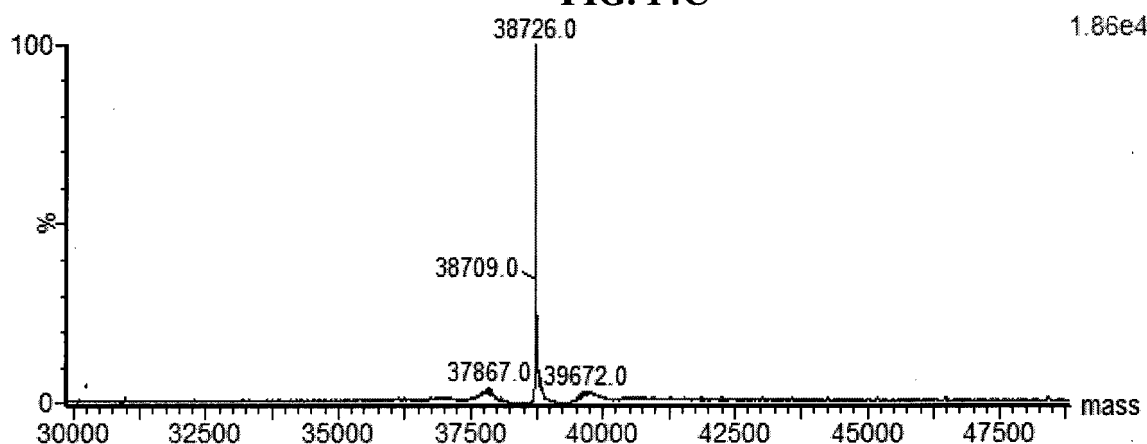


FIG. 13B



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**FIG. 14A****FIG. 14B****FIG. 14C**

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FIG. 14D

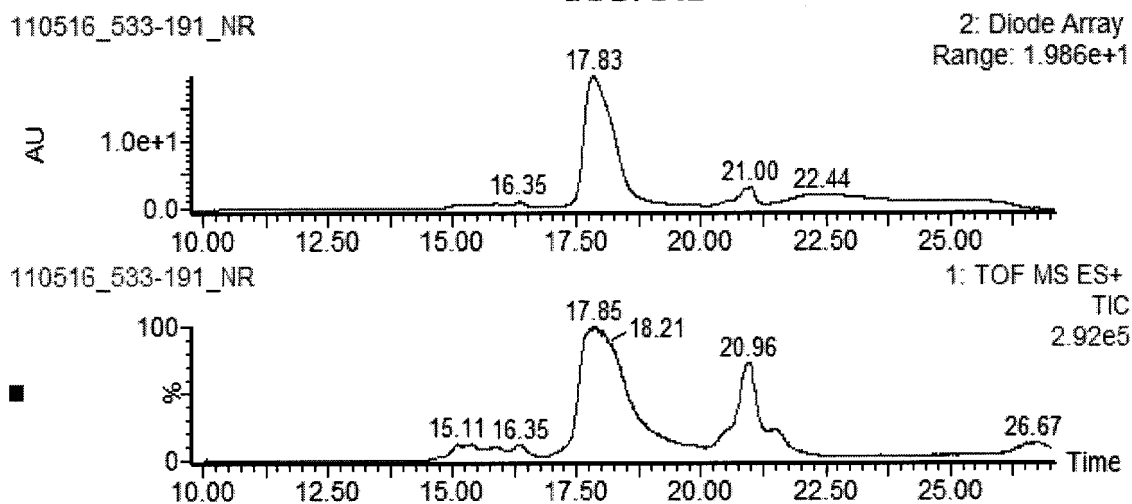


FIG. 14E

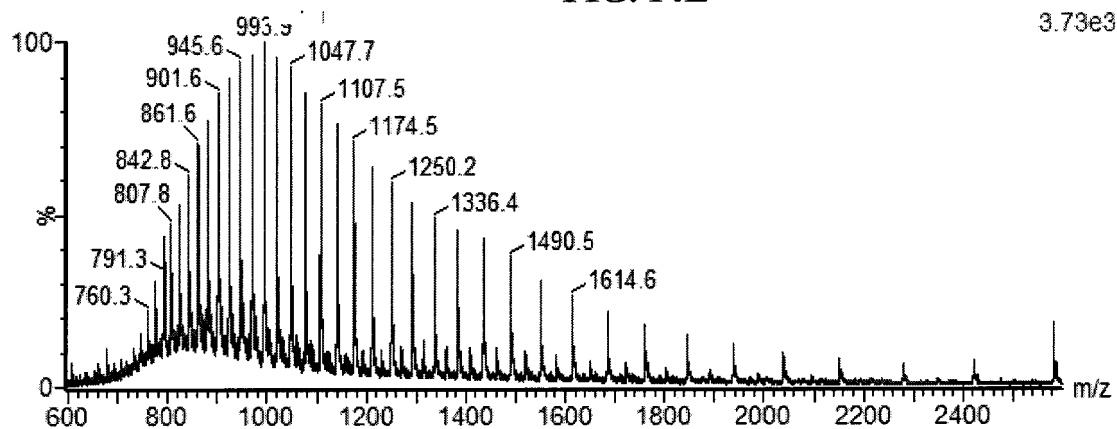
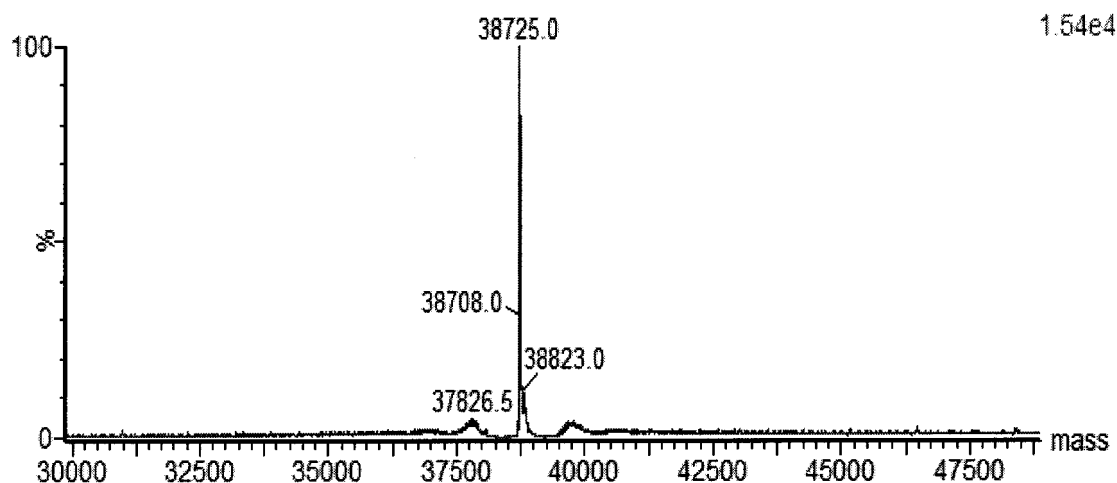
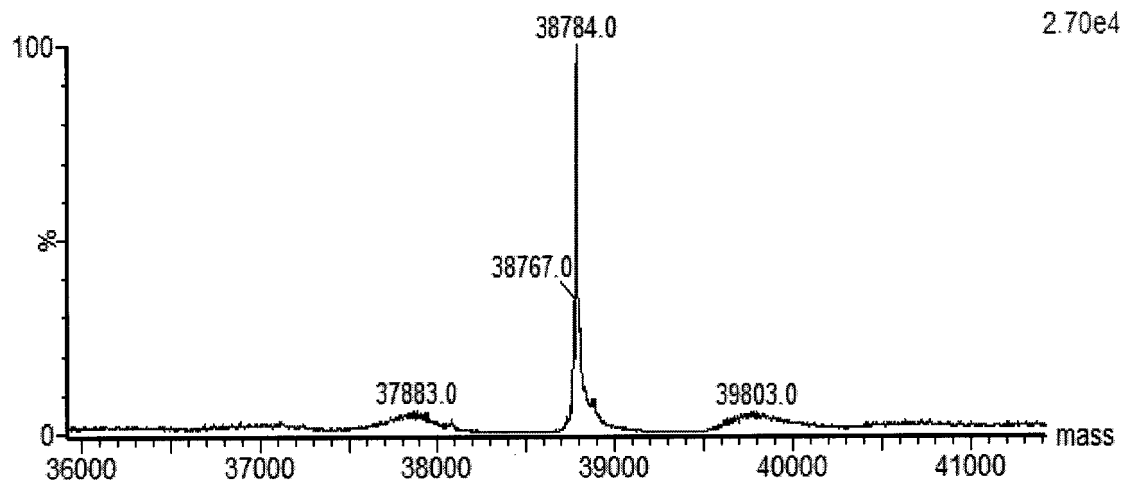
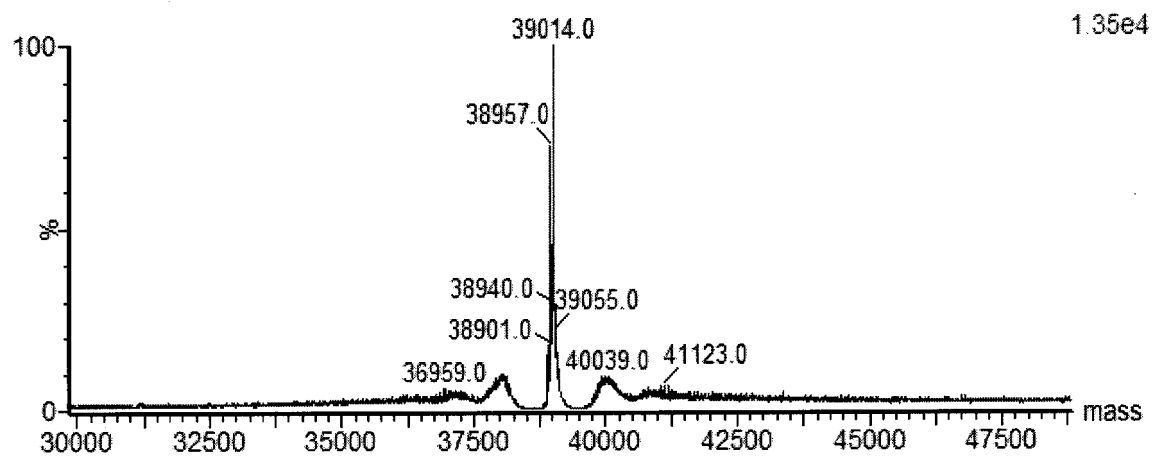


FIG. 14F



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**FIG. 15A****FIG. 15B**

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FIG. 16A

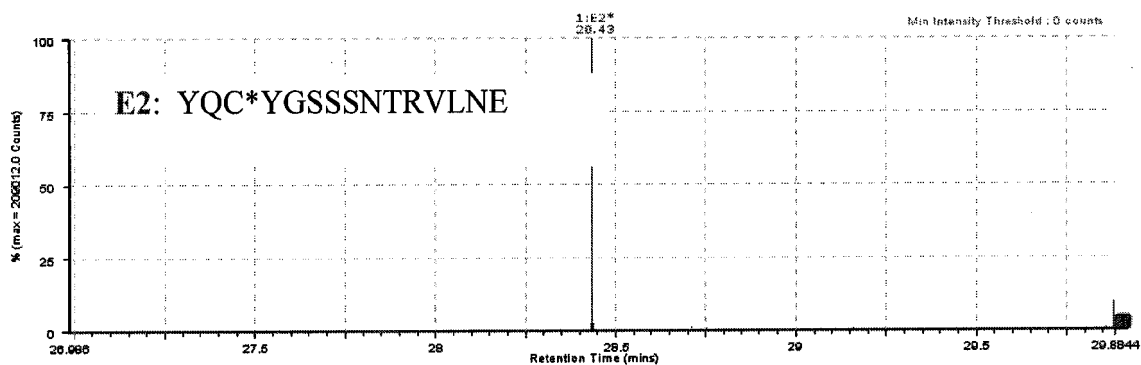


FIG. 16B

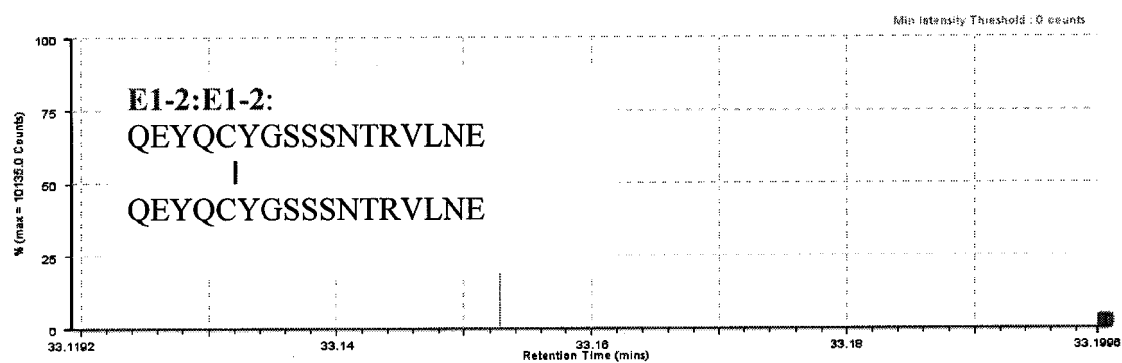


FIG. 17A

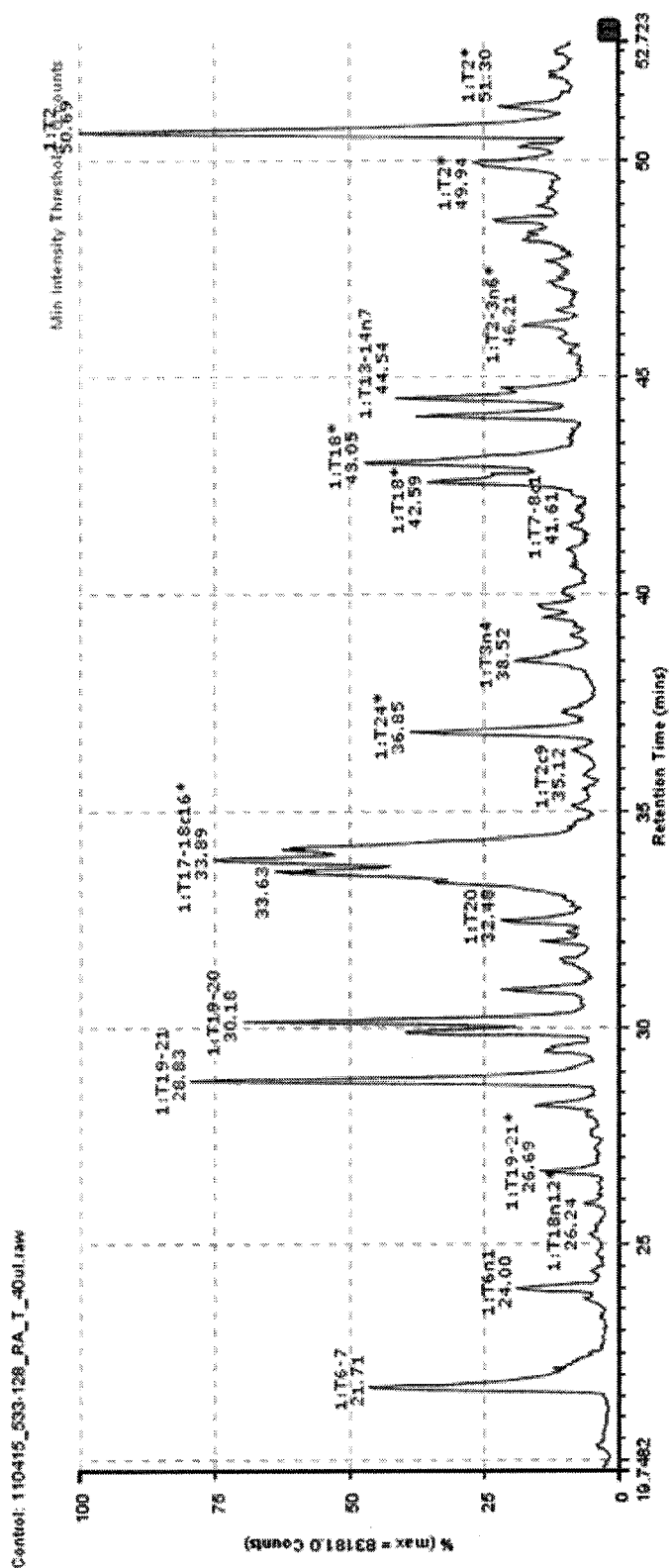
|     |            |            |            |            |            |
|-----|------------|------------|------------|------------|------------|
| 1   | QEYQCYGSSS | NTRVLNELNY | DNAGTNLYNE | LEMNYYGKQE | NWYSLKKNSR |
| 51  | SLGENDDGNN | EDNEKLRKPK | HKKLKQPADG | NPDPNANPNV | DPNANPNVDP |
| 101 | NANPNVDPNA | NPANPNANP  | NANPNANPNA | NPANPNANP  | NANPNANPNA |
| 151 | NPANPNANP  | NANPNANPNA | NPANPNVDP  | NANPNANPNA | NPANPNANP  |
| 201 | NANPNANPNA | NPANPNANP  | NANPNANPNA | NPANPNANP  | NANPNANPNA |
| 251 | NPKNKQNG   | QGHNPNDPN  | RNVDENANAN | SAVKNNNE   | PSDKHIKEYL |
| 301 | NKIQNSLSTE | WSPCSVTGNN | GIQVRIKPGS | ANKPKDELDY | ANDIEKKICK |
| 351 | MEKSSVFNV  | VN         |            |            |            |

FIG. 17B

|     |            |            |            |            |            |
|-----|------------|------------|------------|------------|------------|
| 1   | QEYQCYGSSS | NTRVLNELNY | DNAGTNLYNE | LEMNYYGKQE | NWYSLKKNSR |
| 51  | SLGENDDGNN | EDNEKLRKPK | HKKLKQPADG | NPDPNANPNV | DPNANPNVDP |
| 101 | NANPNVDPNA | NPANPNANP  | NANPNANPNA | NPANPNANP  | NANPNANPNA |
| 151 | NPANPNANP  | NANPNANPNA | NPANPNVDP  | NANPNANPNA | NPANPNANP  |
| 201 | NANPNANPNA | NPANPNANP  | NANPNANPNA | NPANPNANP  | NANPNANPNA |
| 251 | NPKNKQNG   | QGHNPNDPN  | RNVDENANAN | SAVKNNNEE  | PSDKHIKEYL |
| 301 | NKIQNSLSTE | WSPCSVTGNN | GIQVRIKPGS | ANKPKDELDY | ANDIEKKICK |
| 351 | MEKSSVFNV  | VN         |            |            |            |



FIG. 17D



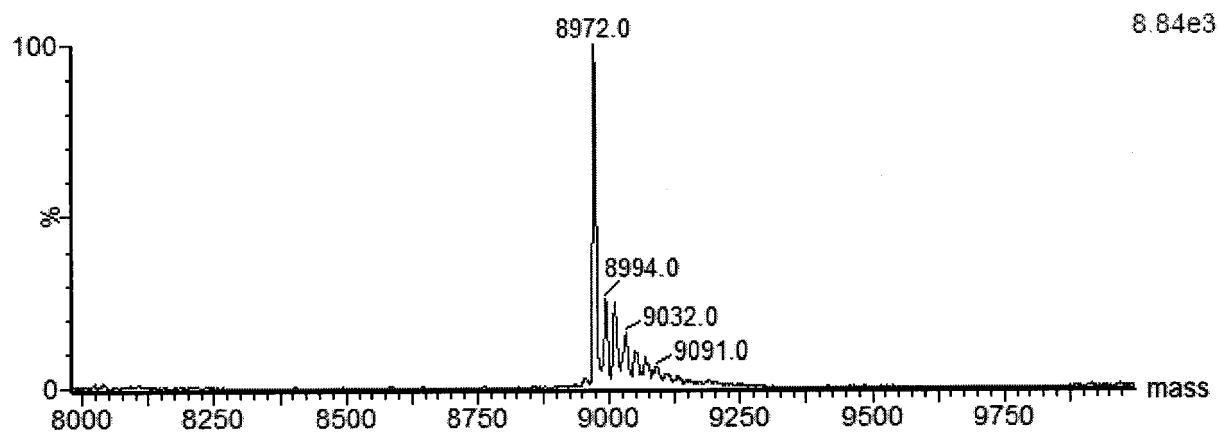
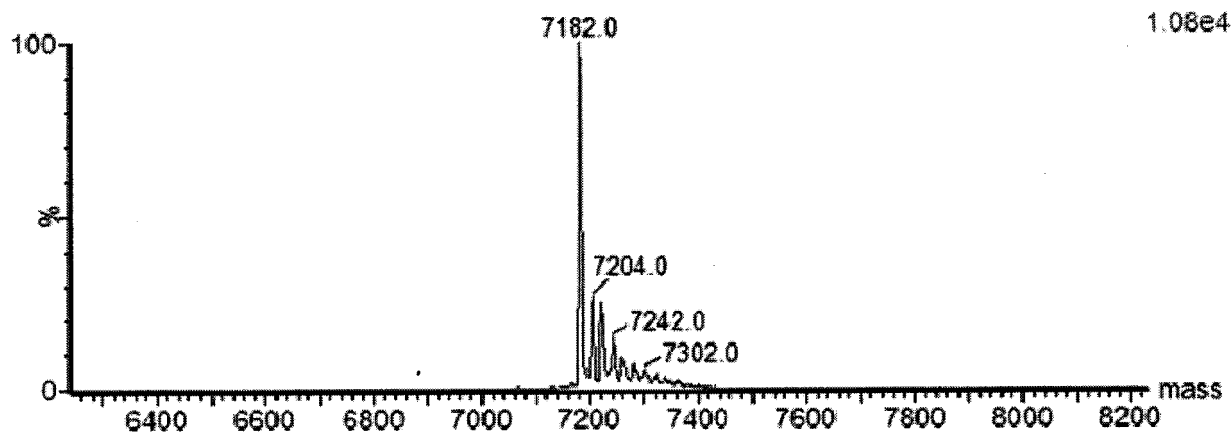
**FIG. 18A****FIG. 18B**

FIG. 19A

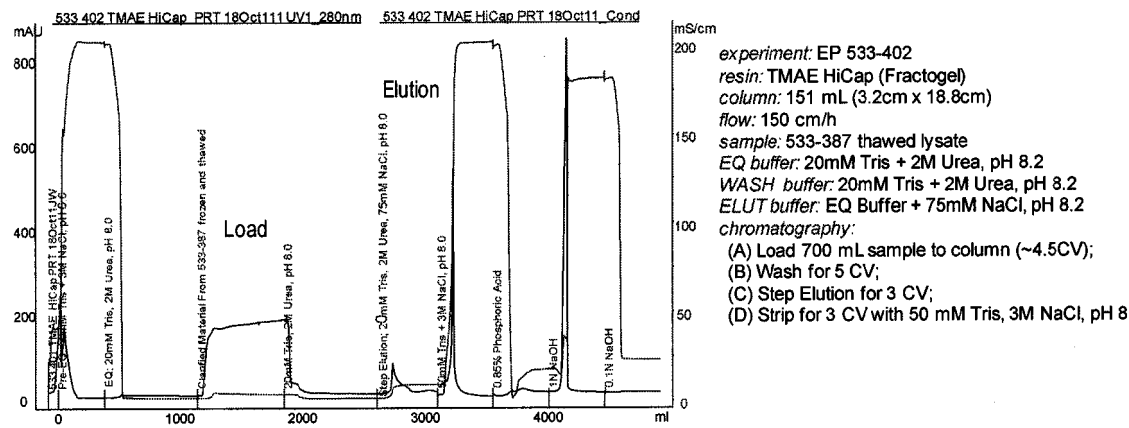


FIG. 19B

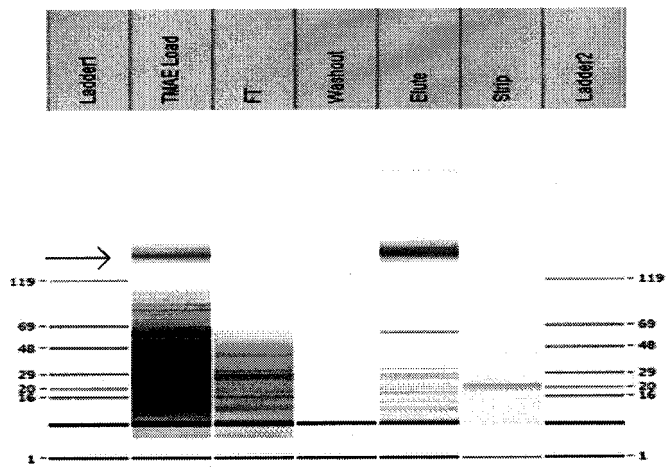


FIG. 20A

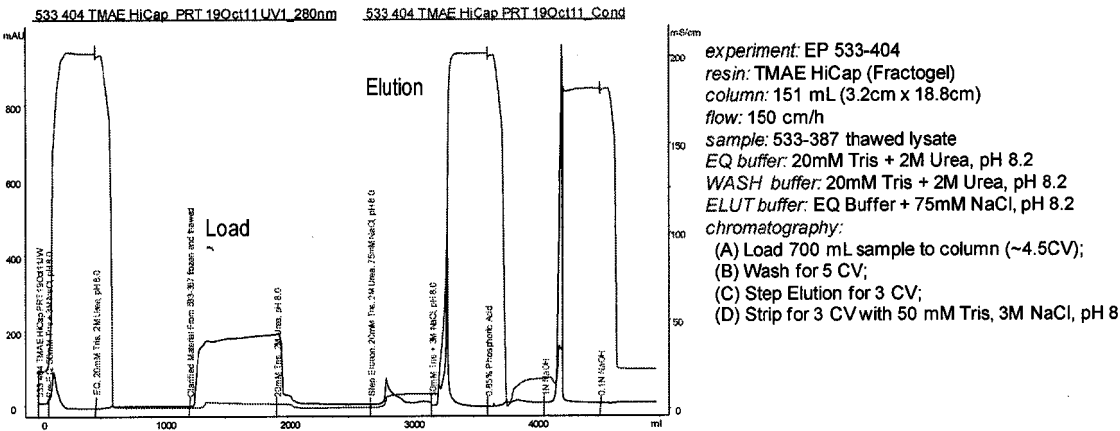


FIG. 20B

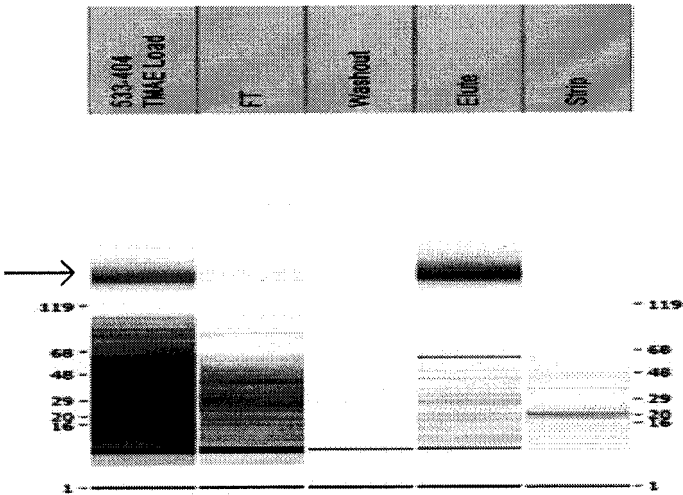


FIG. 21A

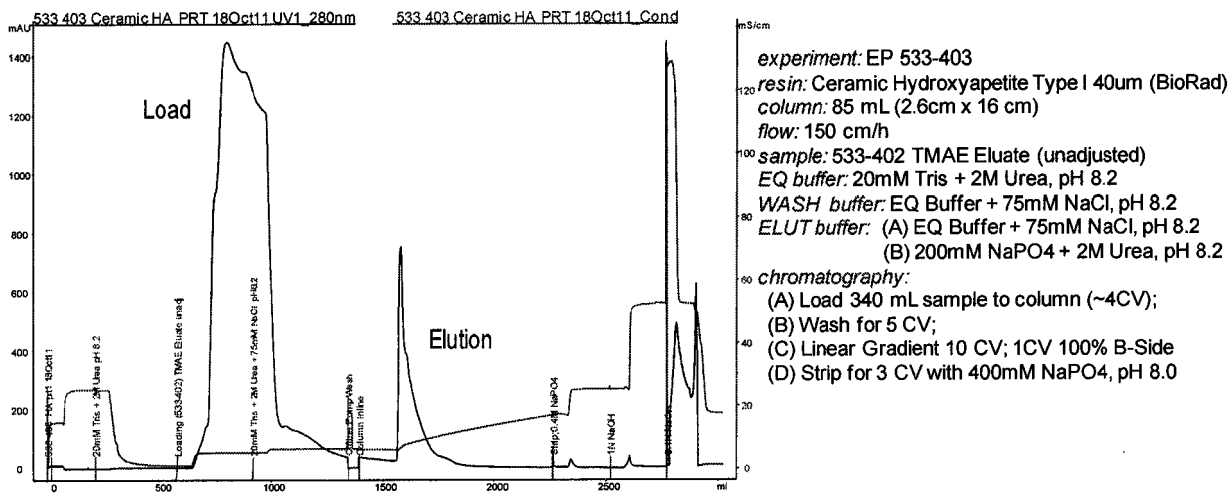
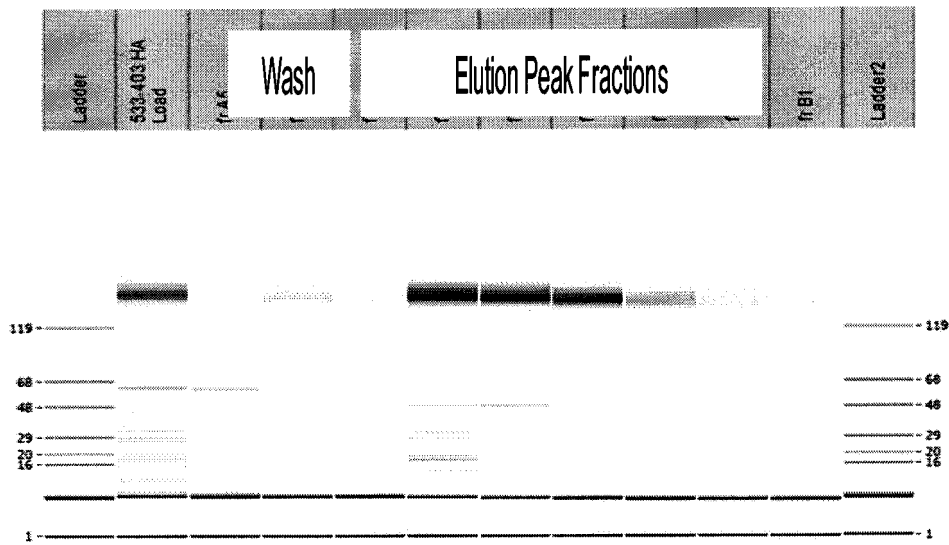


FIG. 21B



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FIG. 22A

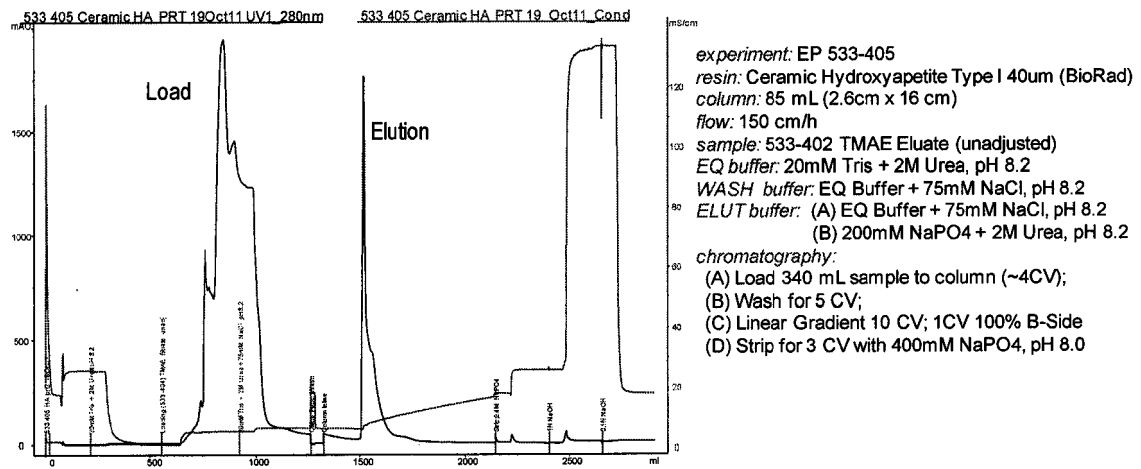


FIG. 22B

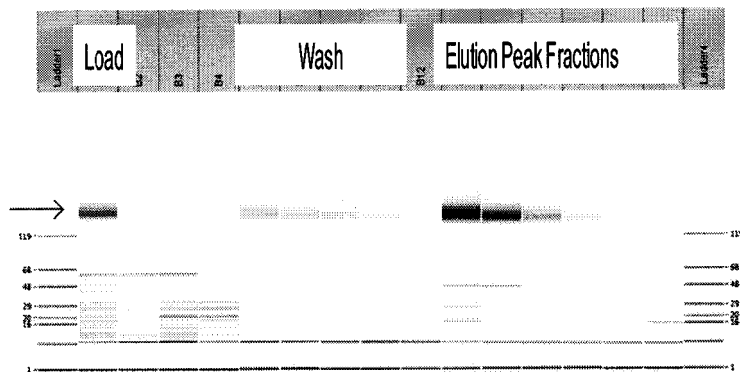


FIG. 23

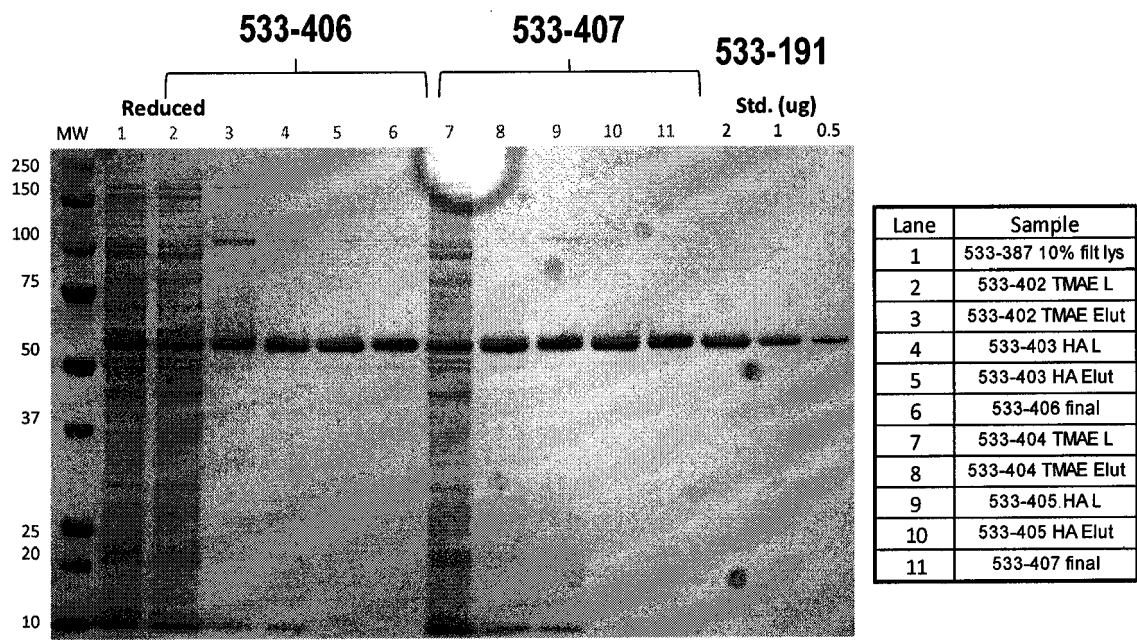


FIG. 24

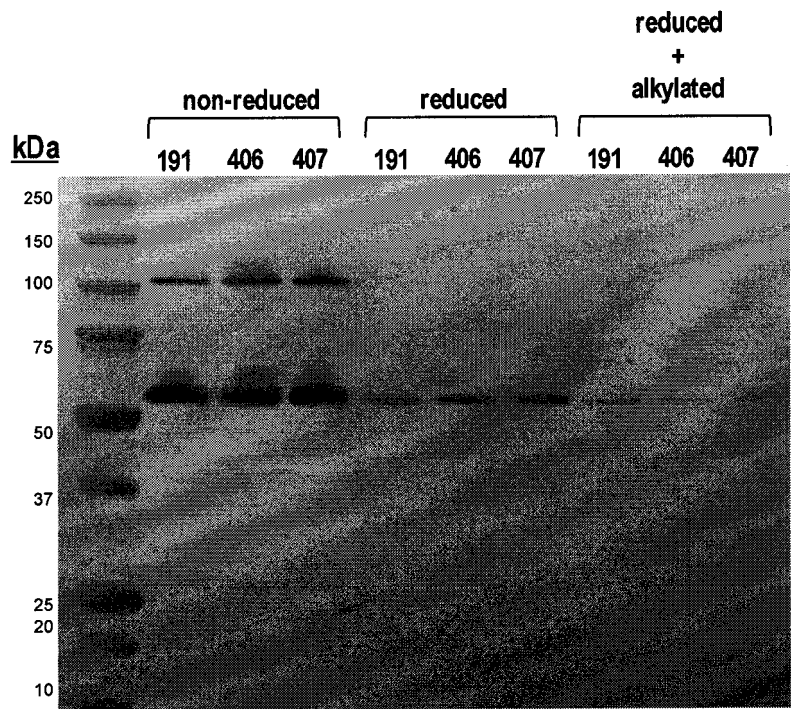


FIG. 25A

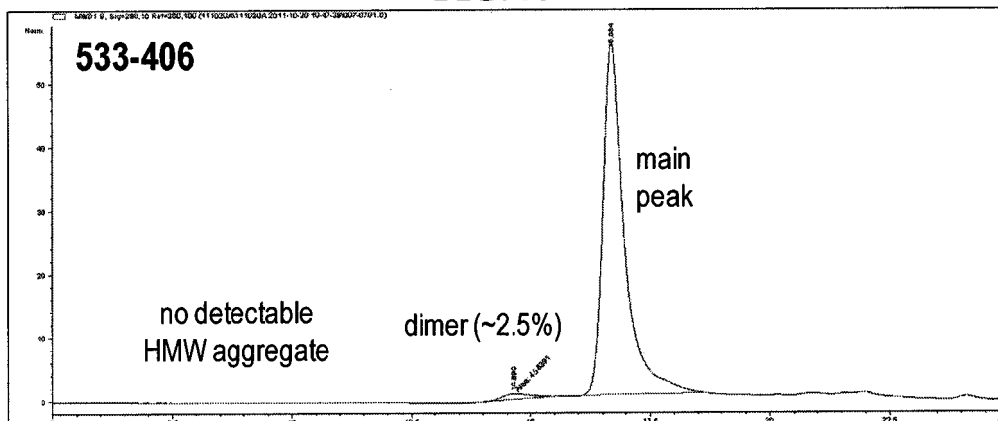


FIG. 25B

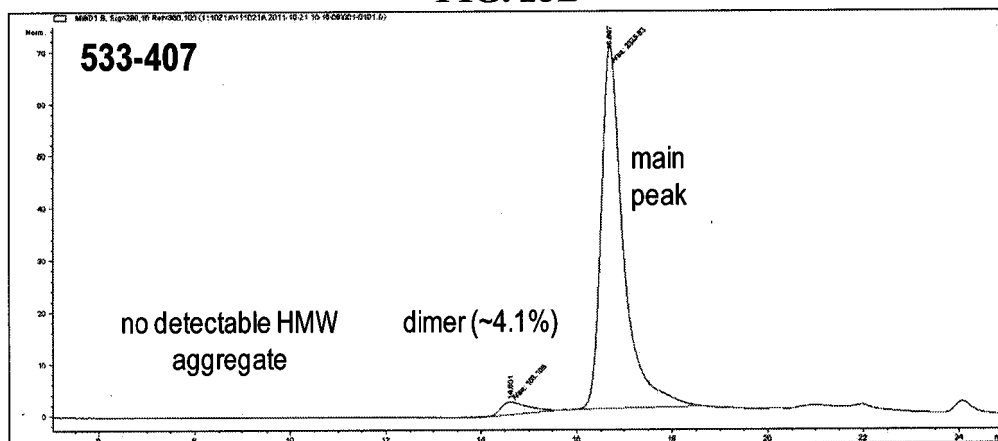
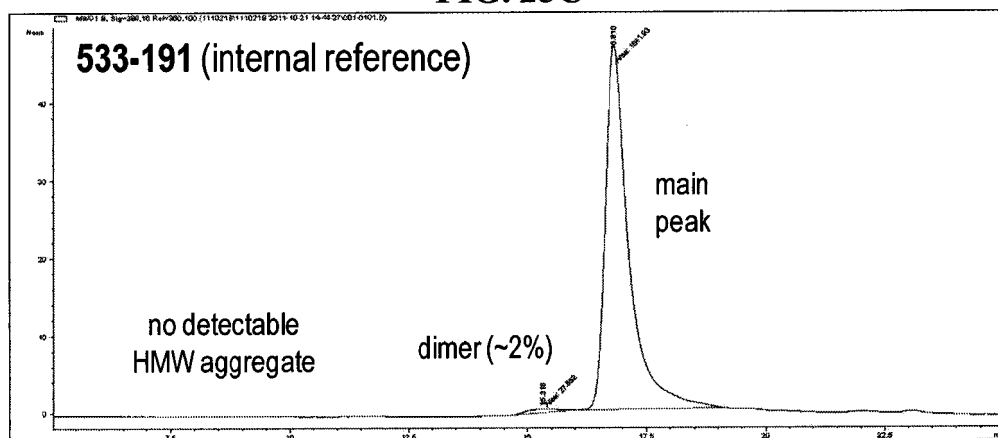


FIG. 25C



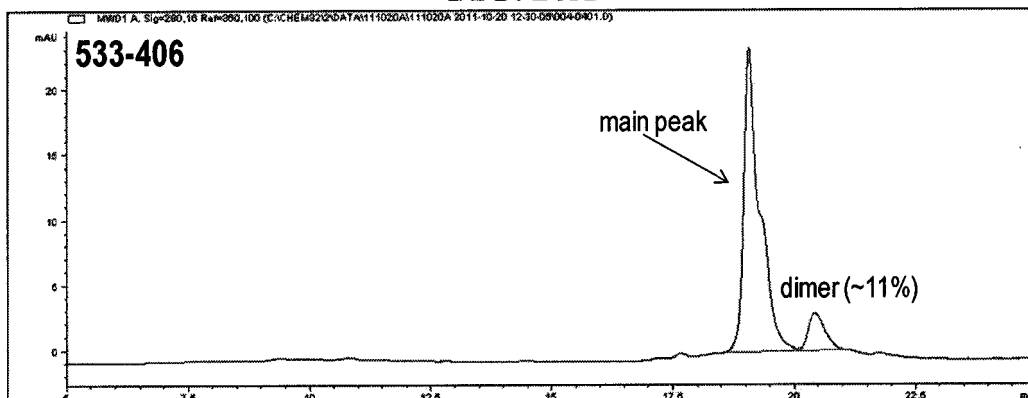
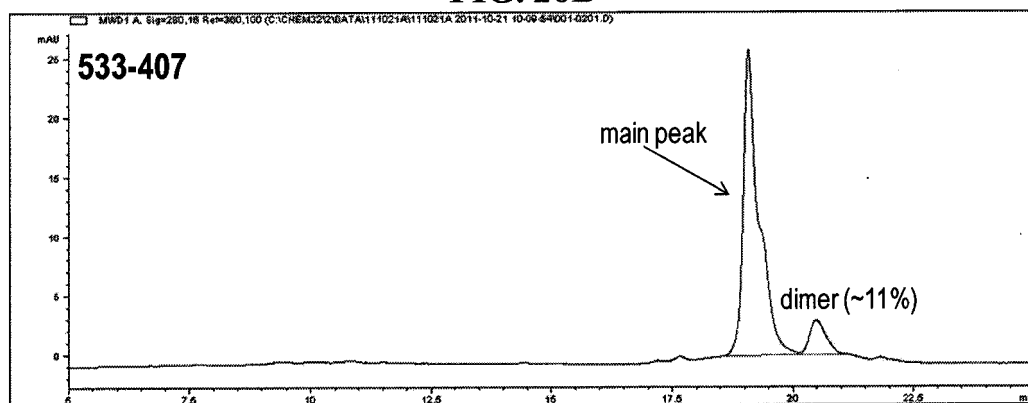
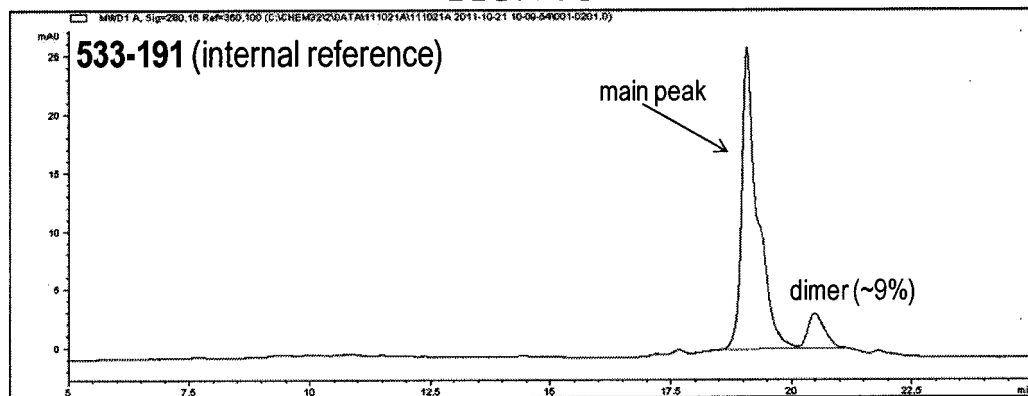
**FIG. 26A****FIG. 26B****FIG. 26C**

FIG. 27A

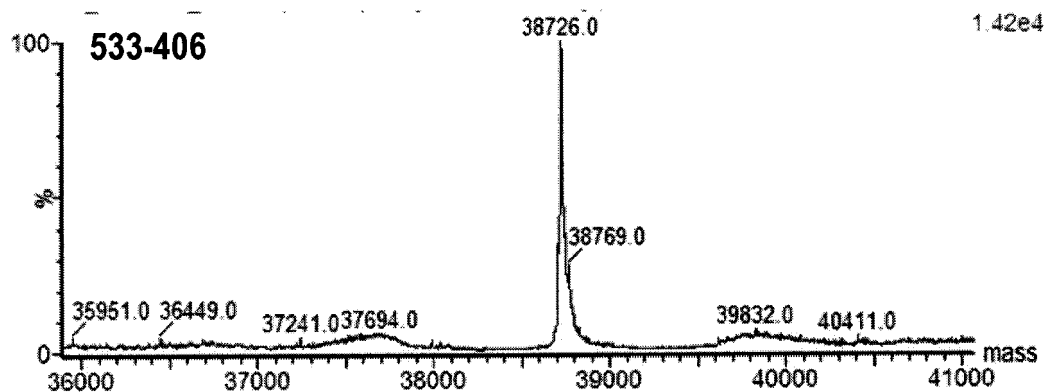


FIG. 27B

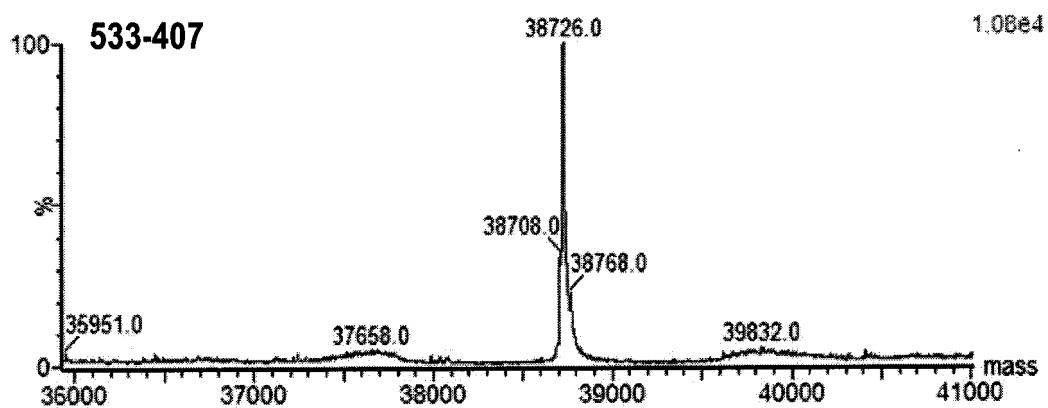
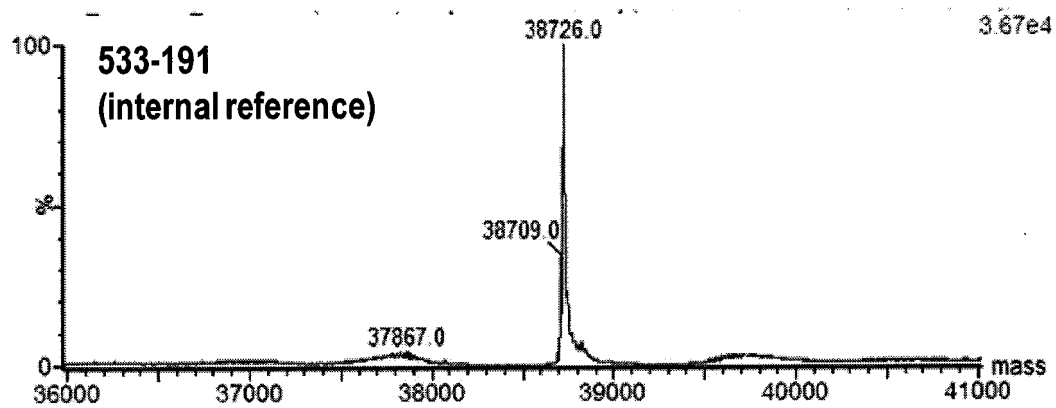


FIG. 27C



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FIG. 28A

Control: 111027\_533-406\_A\_9.raw

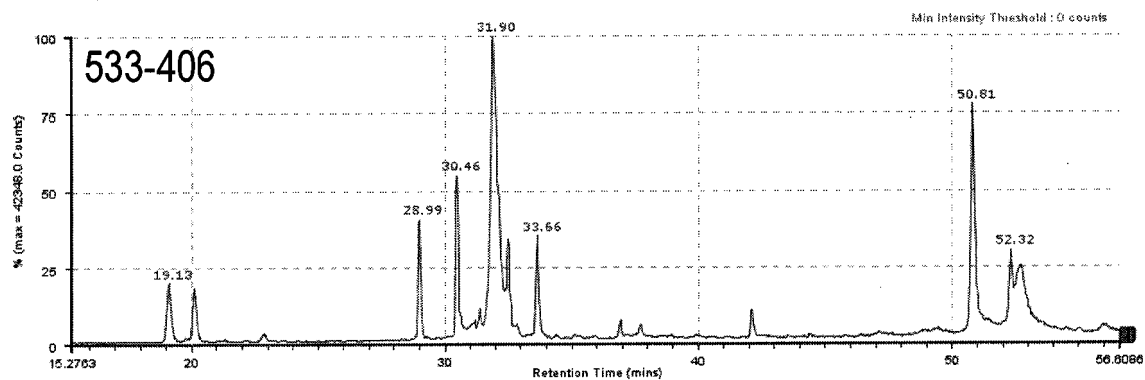


FIG. 28B

Analyte: 111027\_533-407\_A\_9.raw

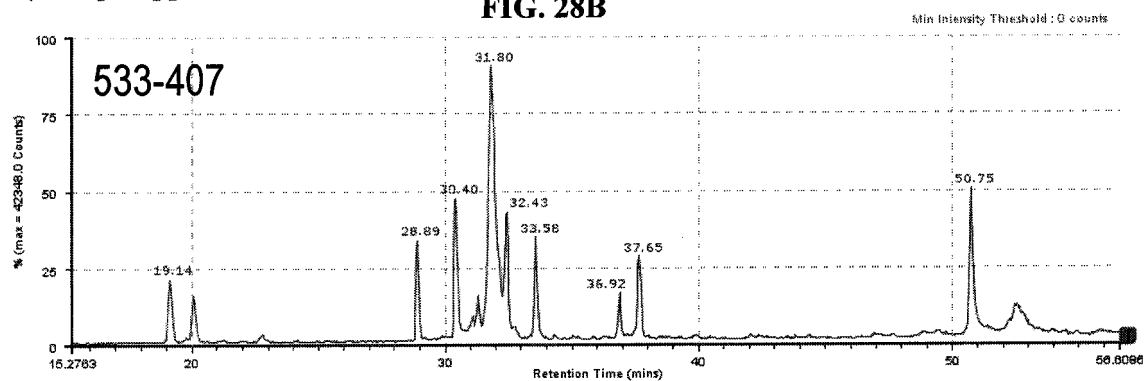


FIG. 28C

Analyte: 111000\_533-191\_NR\_DA\_G\_2ug.raw

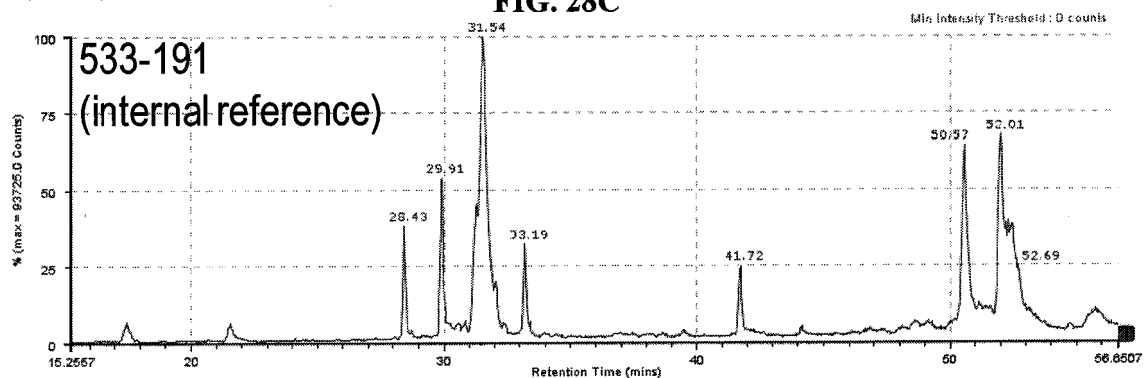


FIG. 29A

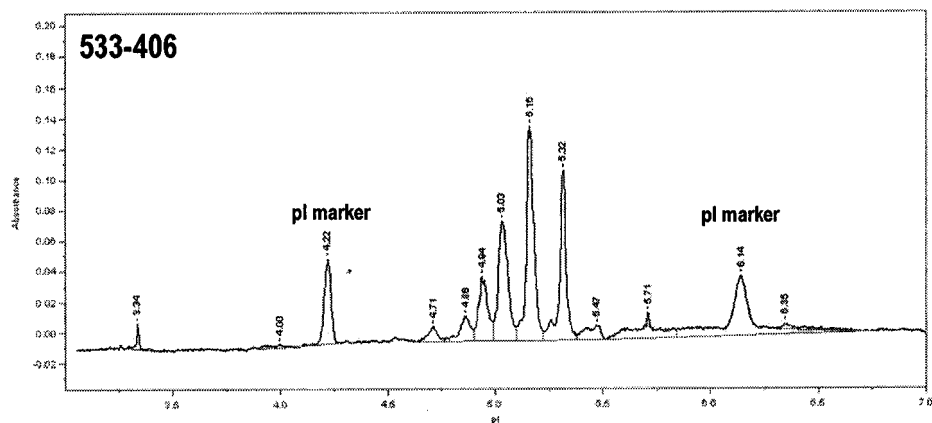


FIG. 29B

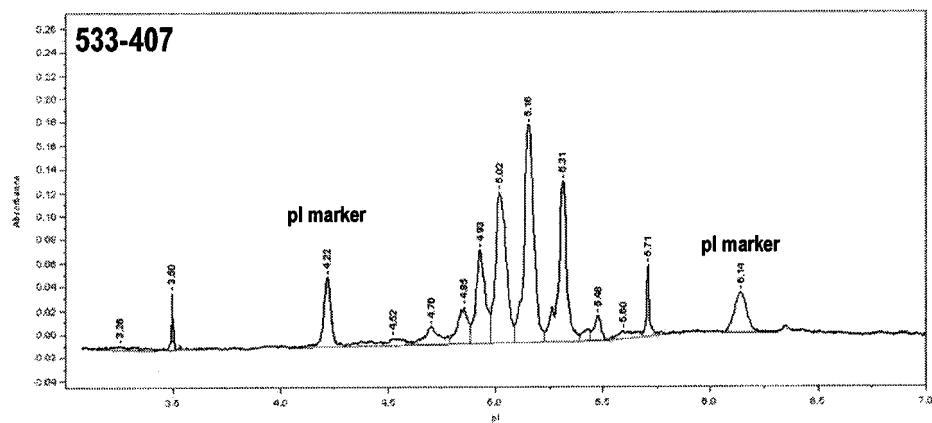
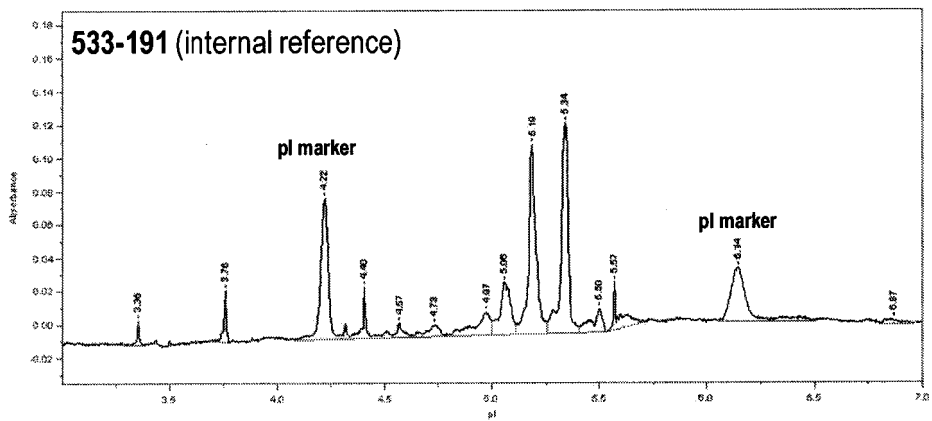


FIG. 29C



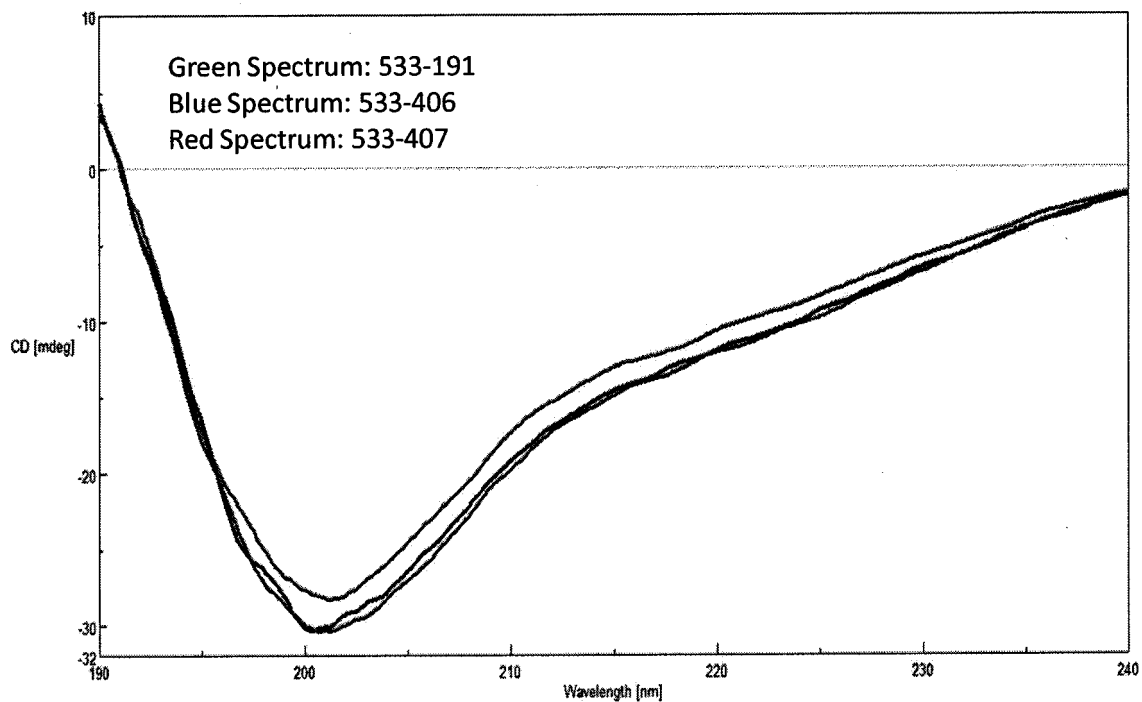
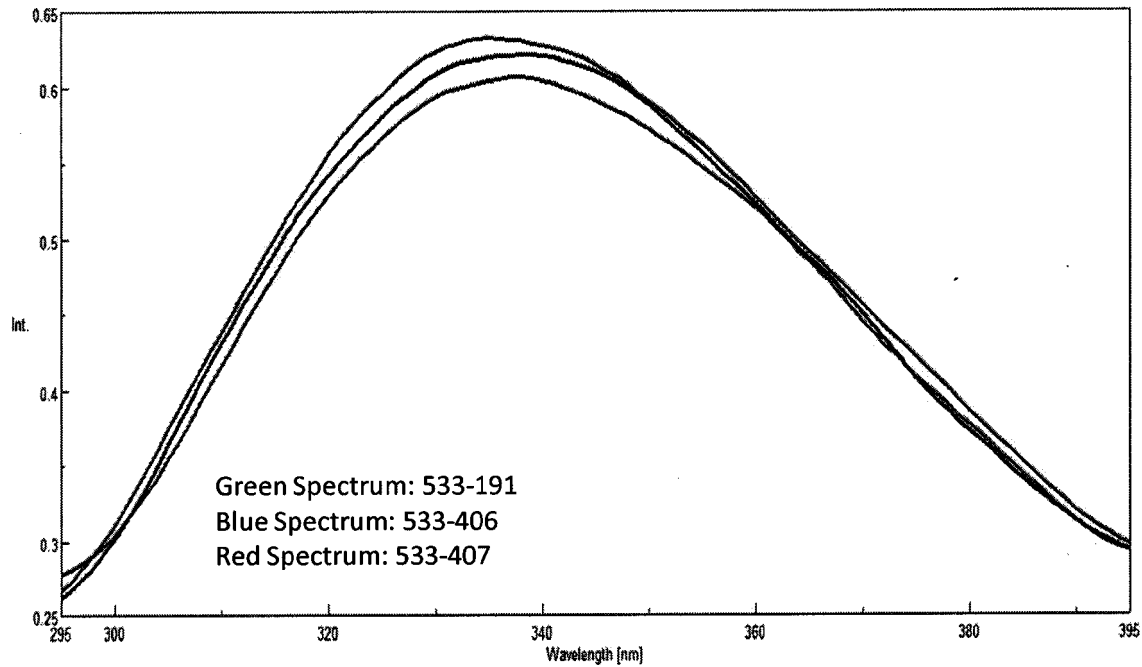
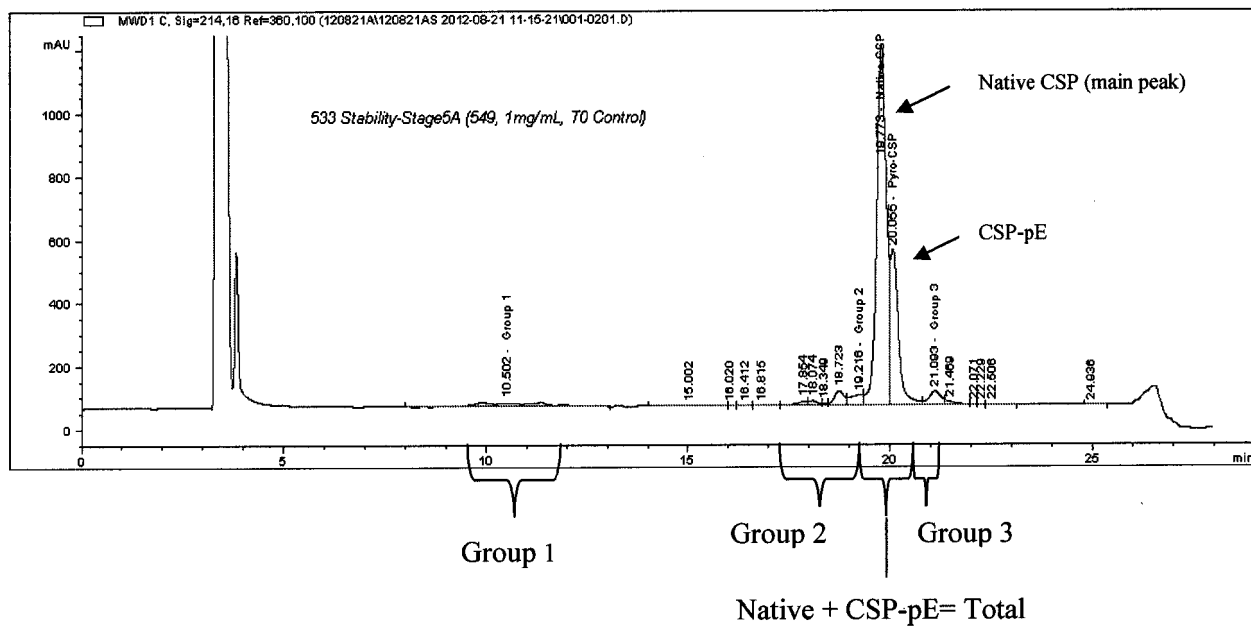
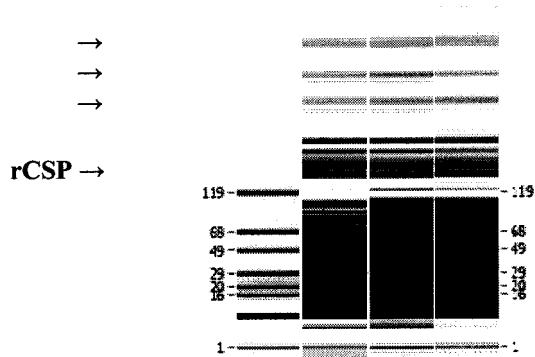
**FIG. 30A****FIG. 30B**

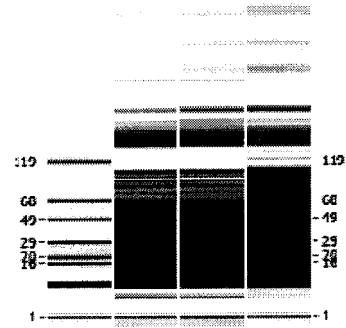
FIG. 31



**FIG. 32A**



**FIG. 32B**



**FIG. 32C**

