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10-0433437
2004 05 18(21) 10-2001-0043683
(22) 2001 07 20(65)
(43)10-2002-0008771
2002 01 31(30) JP-P-2000-00220770 2000 07 21 (JP)
JP-P-2001-00122998 2001 04 20 (JP)(73) 가 가
2 2 3

(72) 2 2 3 가 가

2 2 3 가 가

(74)

:

(54) CMOS

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(1) (2) (3) (4) (5) (6) (1) (4)

WSi (3) WSiN poly-Si (6) W

(5)

1

, CMOS , ,

1	1
2	1
3	2
4	2
5	2
6	2
7	2
8	2
9	2
10	3
11	3
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14	5
15	5
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18	9
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23	10
24	10
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1 :
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41 :
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[illegible]

가 . / , SAC , SAC , 가 . , 가 , CoSi₂/poly-Si SAC , CoSi₂/poly-Si (Polycide) , CoSi₂/poly-Si , CoSi₂/poly-Si , SAC 가 , / / 'A Novel 0.15 μ m C MOS Technology using W/WNx/Polysilicon Gate Electrode and Ti Silicided Source/Drain Diffusions' IEDM'96 , pp.455-458 , 'Formation mechanism of ultrathin WSiN barrier layer in a W/WNx/Si system' Applied Surface Science 117/118(1997), pp.312-316

12 (2) (3) , WNx WSiN (5) , W (6) (1) poly-Si (1) 가 5 , 2 , (3) (5) , SAC (6) 1 (6) () , , SAC (5) 2 Si , 12 (6) W 가 (5) WNx WSiN Si (5) (5)

13 , WNx WSiN / 가 13 (3) (6) , / 가 12 13 12 / Rc, 1 $\times 10^{-5}$. cm² J . 13 / 가 , WN x WSiN WNx WSiN / ,

1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835,

, 3 (1) (2) poly-Si
 3nm (3) CVD(Chemical Vapor Deposition) 100nm (2)
 (2) (3) WSi (4) WN
 6nm (11) 5nm 6 (4) 7
 (11) W (6) 40nm (3),
 4), (11) 950 (6) (4)
 , 9 (11) (4)
 , (5) 1.5nm (5)
 WSiN , WN N W (11)
) WN (6) (5) W
 MISFET / (11)
 (5) (4) (11) (5)
 / (5)
 3 (11) (4) (5)
 2 (11) (4) (5)
 , 2 7 (11) (4) (4)
 , 950 (11) (4)
 , 10 (11) (5) 1.5nm (11) (5) W
 SiN , (11) WN (6) (3),
 4), 11 (5) (6) (5)
 , 2 가
 4 (5)
 1 (5) SiN SiO₂ , SiON (3) poly
 , (6) 1 W , (4) WSi 2 가
 , /
 (4) W, Mo, Ti, Ta, Nb, V, Zr, Hf, Cr, Co
 5 4 , 3 5 11, 1
 4, 15 가 , (1) (2)
 , 2 (2) 3nm (3). (4).
 poly-Si (3) CVD 100nm (4).
 , (5). 14 (4) SiN (5) CVD
 3nm , 15 (5) W
 (6) 40nm (3),
 , 11 가
 (4), (5) (6)
 , 4

6
1, (5)
(4) WSi / (3) TiN poly-Si (6) W
2 가
(4) (5) W, Mo, Ti, Ta, Nb, V, Zr, Hf, Cr, Co
7
4, 15 6 3 5 11, 1
, 2 가 (1)
poly-Si (2) 3nm (3). (2)
(3) CVD 100nm (4).
(3) WSi (4) 15nm
(5). 14 가 (4) TiN (5) W
10nm 40nm 가 (3),
(4), 11 가 (6)
(5) (6)
, 6
8 1 (4)
16 16 (41) 1
(4), (41)
, (41) 1 가 WSi
6) W (5) WSiN (3) poly-Si (
(4)
가 가
(B P, As)가
가
가 CMOS(Complementary Metal Oxide Semiconductor)
가 가
, CMOS P MOS N MOS 가
1 1 (5) (3)
(3) (4) 가 가
(4) 가 (4) CMOS (3)
(4) 가 가
, 가 (4) 가 (3)
, CMOS 가 (3)
가 가

17 CMOS 17
 (1) P (1a) N (1b) , 16
 , P 가 (1a) (2), (3a), (41), (5) (6)
 가 (1b) , N (1b) (2), 가 (3b),
 (41), (5) (6) 가 (10a, 10b) , N
 (3a, 3b) (1a, 1b) / MOS MOS
 MOS 17 (7) , MOS N MOS
 (8) , SAC , P MOS 9
 (9) (4)
 , / 2
 가 ,
 (41) (5) W, Mo, Ti, Ta, Nb, V, Zr, Hf, Cr, Co
 9
 8 , 3 5 18
 22 , 2 가 (1)
 poly-Si (2) 3nm 100nm (3). , (2)
 (3) CVD (4). (3)
 (3) WSi (4) 5nm
 (5). (4) 18 (41)
 4) 가 900 (11)
 , 10nm (41) WN (11) W
 , 19 5nm (41) 20 (11) W
 (6) 40nm (3),
 , 21 (41), (11) (6) (11) (41)
 , 950 (3) 22 (11) (5)
 (41) (3) WSiN (11) N W (5)
) 1.5nm (5) WN WN (6)
 , 2 (11) WN (11)
 , W MISFET / (41) (7) SAC
 (6) SiN [17 (7)] CVD
 (5) (41) 8 (3) (11)
 , (5) /
 10 9 (11) (41) (3)
 9 (5) 20

, 950 , (11) (41)
 (3) 23 (11) (5)
 (41) (3) (5) WSiN , (11) WN (5)
) 1.5nm (11) (5) W (3),
 (6) 24 (41), (5) (6) , 9 가
 11 8 , (5)
 , (5) SiN SiO₂ , SiON (3)
 poly-Si , (6) W , (41) WSi 가
 , / 2
 , (41) W, Mo, Ti, Ta, Nb, V, Zr, Hf, Cr, Co
 12 11 , 3 5 18,
 24 26 , 2 가 (1)
 poly-Si (2) 3nm (3). , (2)
 (3) CVD (4) 100nm (4).
 (3) WSi (4) 5nm
 (4) 900 (41) (18).
 , 25 3nm (41) SiN (5) CVD (6)
 40nm 26 (5) W
 , 24 가 (3),
 (41), (5) (6) (41) CVD SAC
 (6) SiN , 11
 13 8 , (5)
 , (5) TiN (3) poly-Si , (6) 8 W ,
 (41) WSi 가
 , / 2 가
 , (41) (5) W, Mo, Ti, Ta, Nb, V, Zr, Hf, Cr, Co
 14 13 , 3 5 18,
 24 26 , 2 (1)
 Si (2) 3nm (3). , (2) poly-Si
 (3) CVD (4) 100nm (4). 5nm
 (3) WSi (5)

, (4) 900 (41) (18).
 , 25 10nm 가 , (41) TiN (5) W (6)
 , 24 가 40nm (3),
 (41), (5) (6) SAC
 , (6) SiN (4) CVD , 13

1 , ,
 2 , , 가
 가 ,
 3 , 1
 4 , 1 , /
 5 , 4
 6 , 2
 7 ,
 8 , 2 , 1 2 가 ,

(57)

1.

, , , 1 , 3
 , 2 ,

2.

(a) , (b) ,
 1 , 3
 (c) , 2 ,
 (d),
 (e)

3.

, , , 1 , 3
 , 2 ,

가

1 2

1 2

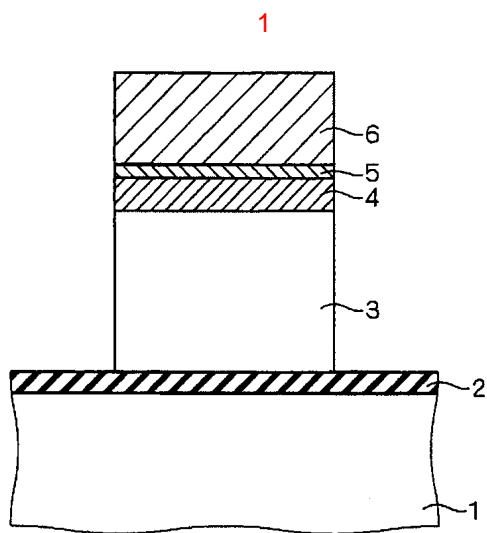
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1 2

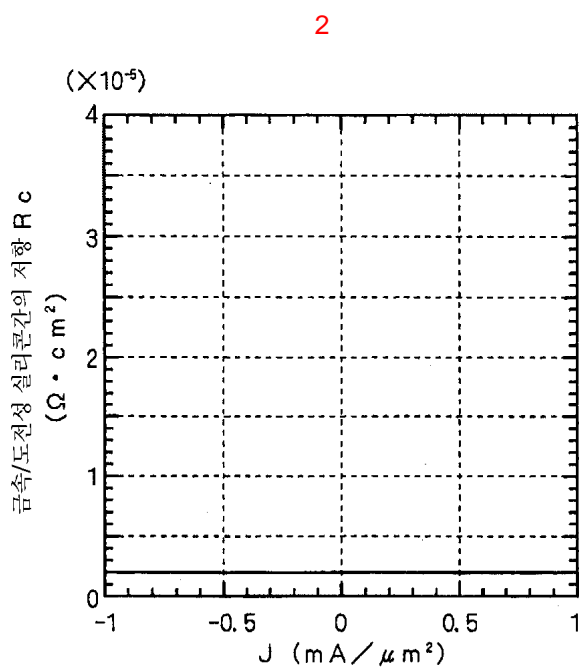
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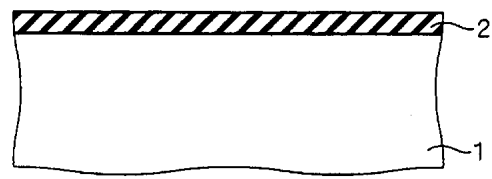
CMOS



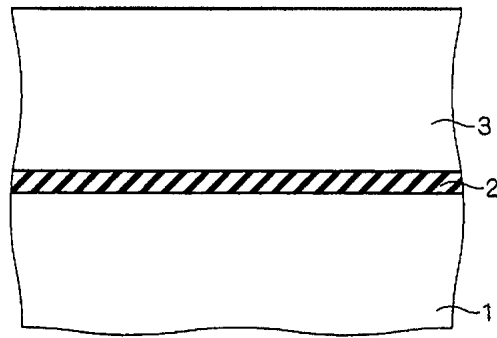
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- 2 : 게이트 절연막
- 3 : 도전성 실리콘막
- 4 : 실리사이드막
- 5 : 배리어막
- 6 : 금속막



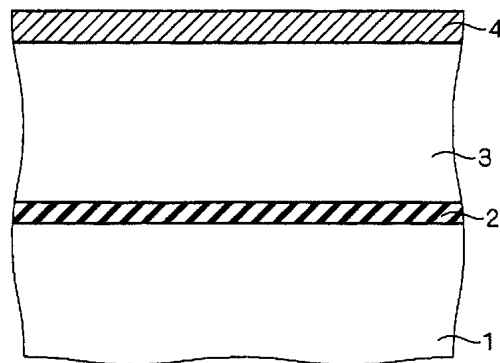
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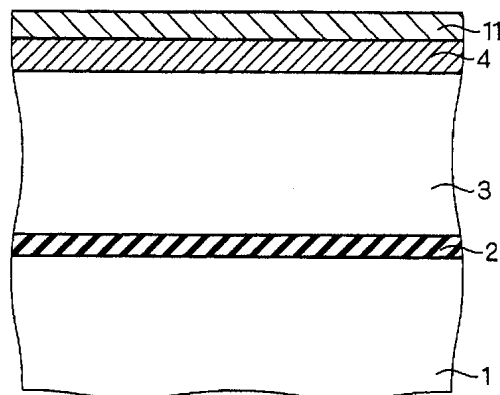
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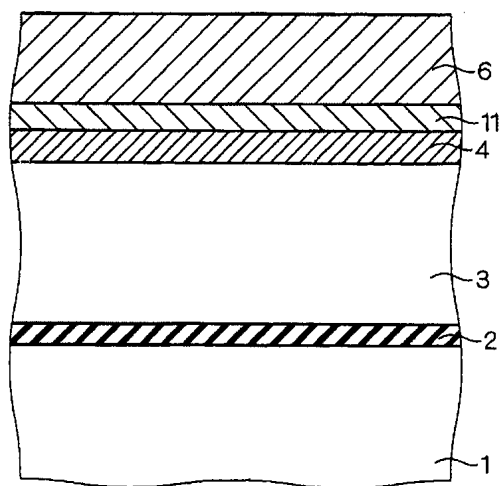


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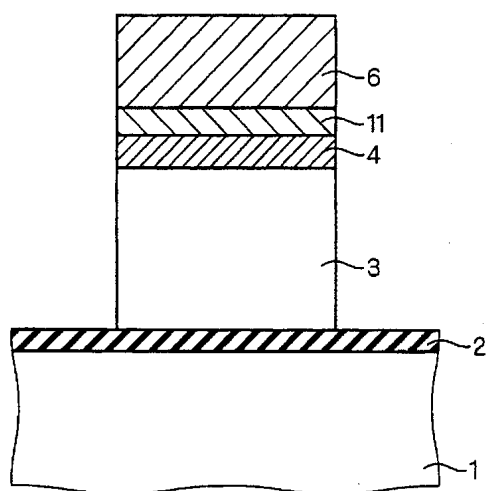


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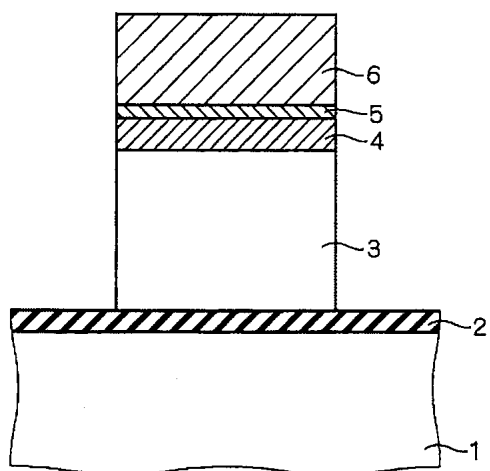
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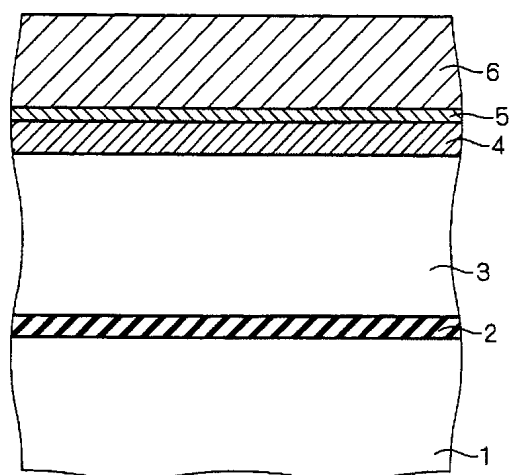
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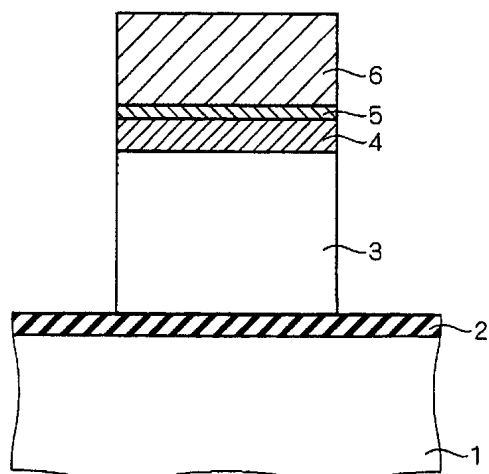
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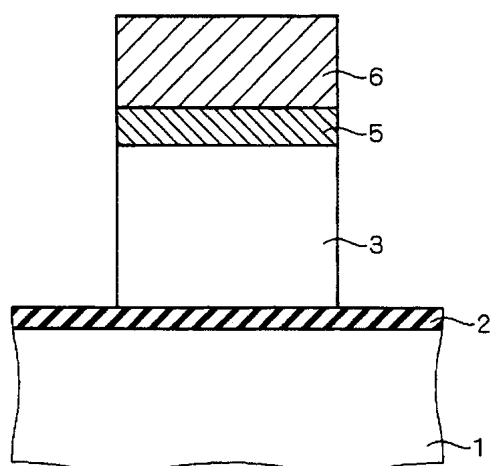
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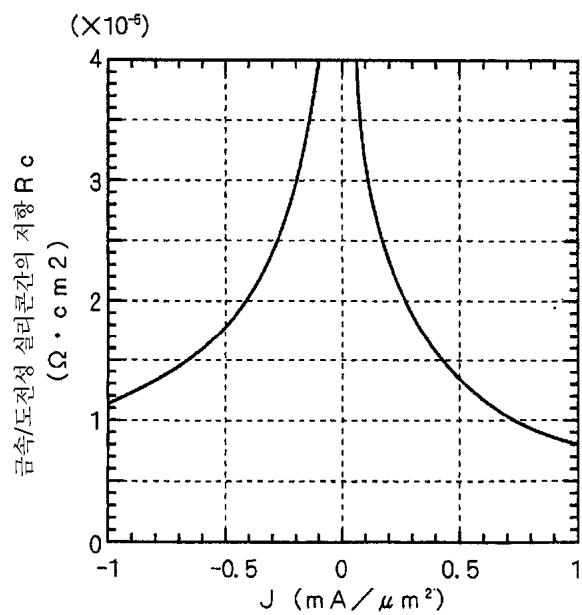
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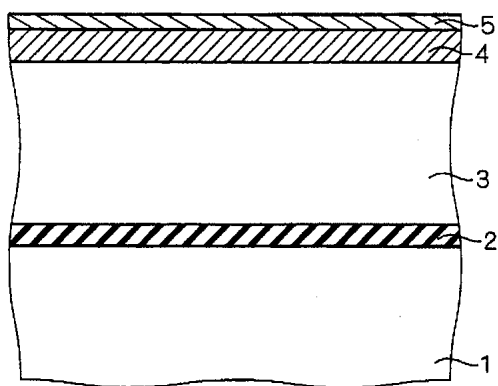
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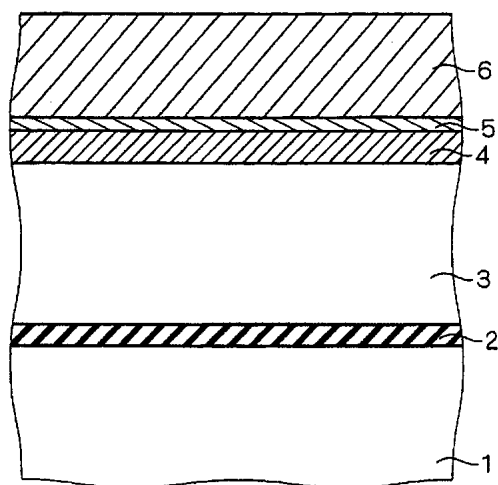
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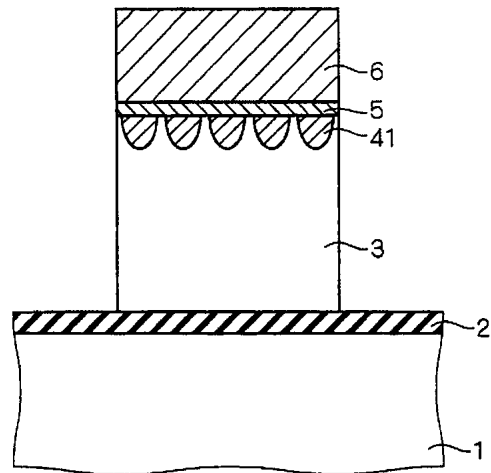
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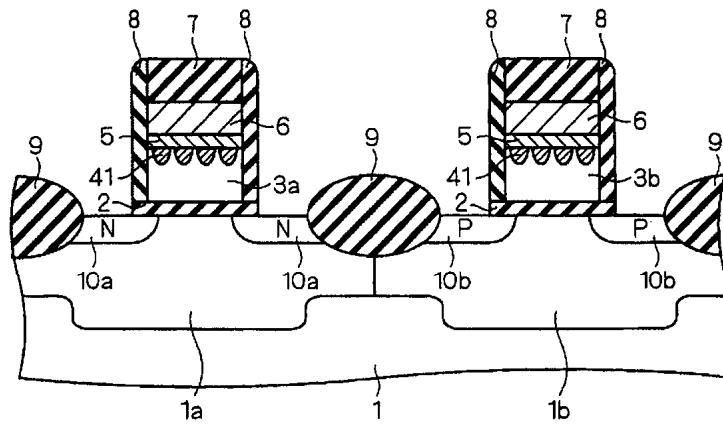


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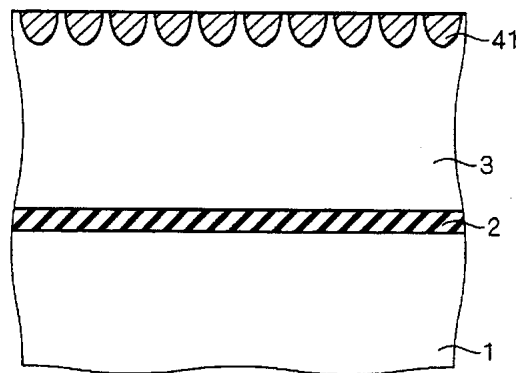


41 : 돔 형상 실리사이드막

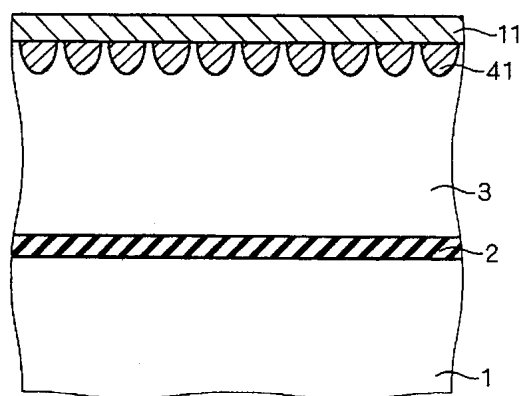
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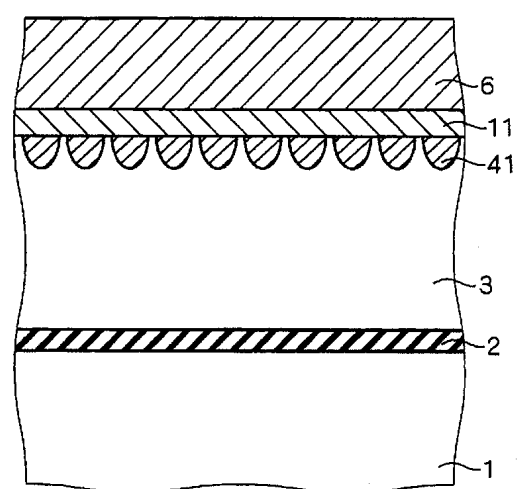
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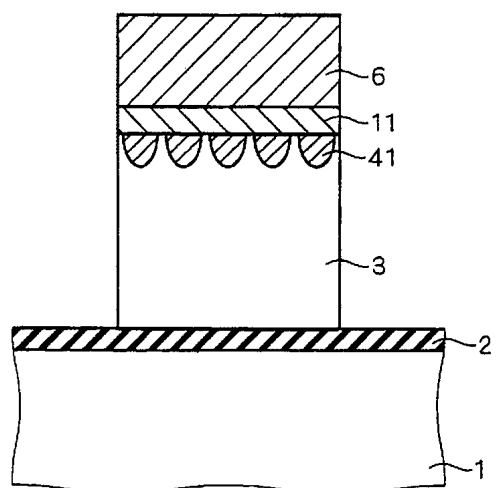
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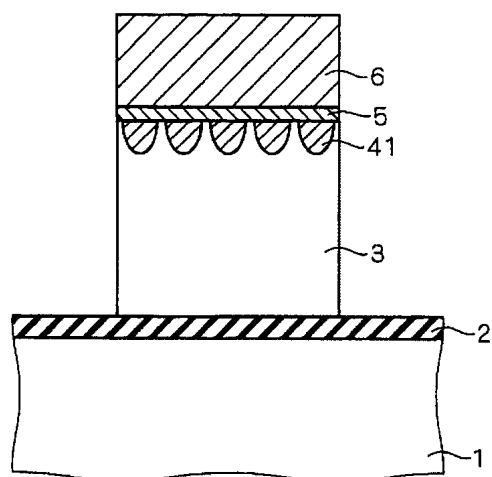
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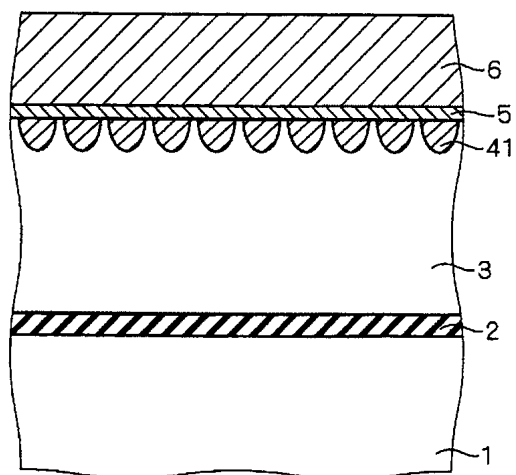
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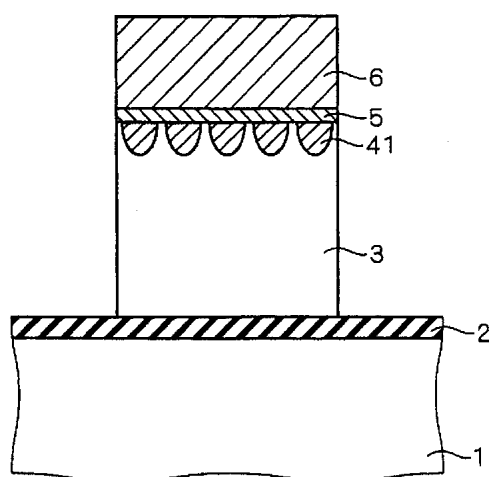
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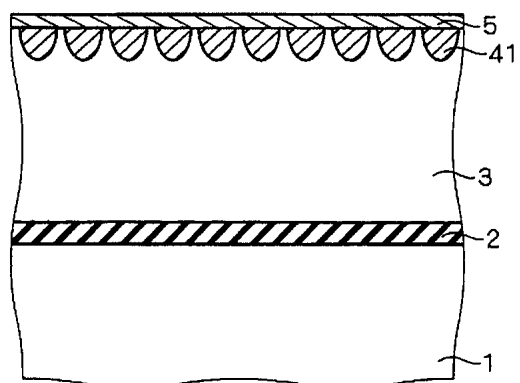
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