

DEVICE FOR EPITAXIAL GROWTH OF SiC AND PRODUCTION OF SiC EPITAXIAL THIN FILM

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Inventor(s) MORONUKI NOBUYUKI, HORIUCHI TAKASHI, MISAWA SHUNJI, TAKAGI KENICHI
Applicant(s) ULVAC JAPAN LTD
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EC Classification
Equivalents.

Abstract

PROBLEM TO BE SOLVED To provide a method for forming a SiC epitaxial thin film, enabling the uniform epitaxial growth of SiC on a 3 inch or larger area, and to provide a device for forming the SiC epitaxial thin film

SOLUTION A SiC epitaxial device 1 is provided with a port 41 for charging highly pure C₂H₂ for forming a carbide layer on the surface of a Si substrate and with two independently controllable helicon spatter guns 21, 31 comprising a helicon spatter gun 21 having a Si target 24 capable of forming a film at a vacuum degree of 10⁻⁴ Torr level in a vacuum chamber 2 having a vacuum degree of 10⁻¹⁰ Torr and the helicon spatter gun 31 having a C target 34. The SiC epitaxial device 1 is used to heat the Si substrate. Further, C₂H₂ gas is charged to form a carbide layer on the surface of the Si substrate 11 under a vacuum of 10⁻⁵ Torr, and argon gas is charged into the vacuum chamber. Si and C are spattered in a stoichiometric ratio of 1:1 from the helicon spatter gun 21 and the helicon spatter gun 31, respectively, at ≥900 deg C under a vacuum of 10⁻⁴ Torr level to form the epitaxial thin film of SiC.

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METHOD FOR LIQUID PHASE EPITAXIAL GROWTH OF SiC SINGLE CRYSTAL AND DEVICE THEREFOR

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Inventor(s). KUNISATO TATSUYA; others. 01
Applicant(s). SANYO ELECTRIC CO LTD
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EC Classification
Equivalents.

Abstract

PURPOSE:To epitaxially grow a silicon carbide single crystal in a liq. phase without leaving molten Si on the surface of an SiC substrate by using this device
CONSTITUTION.A silicon carbide single crystal substrate 9 held by a holder 8 is dipped in molten silicon 6 having a temp gradient to form an epitaxially grown silicon carbide layer on the substrate 9, and then the holder 8 is rotated at high speed by a rotating device 10 when the substrate 9 is pulled up from the molten silicon 6.

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GROWTH METHOD OF SiC SINGLE CRYSTAL THIN FILM

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Inventor(s) IKEDA HITOSHI; others. 04
Applicant(s) JAPAN RADIO CO LTD; others 01
Requested Patent JP1245513
Application Number JP19880072669 19880326
Priority Number(s)
IPC Classification H01L21/205
EC Classification:
Equivalents

Abstract

PURPOSE. To obtain an SiC single crystal film of good quality by a method wherein, using the C₃H₄ sent from a gas-source type MBE device as reactive gas, the partial pressure of gas is set at the specifically prescribed value, and to make it possible to carbonize the gas at a very low temperature.

CONSTITUTION: Using a gas-source type MBE device, an Si substrate is heated up by a heater 3, C₃H₄ is introduced from a gas introducing hole 7 as reactive gas, the partial pressure of the gas is set at 2×10^{-5} - 2×10^{-7} Torr, and an excellent carbonized film is obtained at the Si substrate temperature of 720-750 deg.C. Subsequently, the temperature of the substrate 2 is set at 1000 deg C, and from gas introducing holes 7 and 8, SiHCl₃ is introduced as Si feeding gas and C₂H₄ is introduced as C-feeding gas respectively and an SiC single crystal film is grown at the total pressure of 4×10^{-5} Torr or less. Carbonization and SiC growing temperature are sharply decreased, and an excellent SiC single crystal film can be formed.

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METHOD FOR GROWTH OF SiC SINGLE CRYSTAL

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Inventor(s): KOGA KAZUYUKI, others 01
Applicant(s) SANYO ELECTRIC CO LTD
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EC Classification
Equivalents JP1922010C, JP6045520B

Abstract

PURPOSE. To obtain an SiC single crystal having uniform characteristics, by using a blend of SiC which impurities heat-treated at a specific temperature as an SiC raw material in subliming the above-mentioned raw material to grow the SiC single crystal on an SiC seed crystal.
CONSTITUTION. An SiC raw material is sublimed to grow an SiC single crystal on an SiC seed crystal. In the process, a blend of SiC with impurities, e.g. Al, B, Ga, etc., heat-treated at $\geq 1,800$ deg.C is used as the above-mentioned raw material. When the blend of the SiC with the impurities is heat-treated at $\geq 1,800$ deg.C, the SiC and impurities are crystallographically bonded. Thereby the impurities will not individually vaporize even at high temperatures and characteristics of the resultant SiC single crystal become uniform.

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GROWTH METHOD FOR SiC SINGLE CRYSTAL

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Inventor(s) KOGA KAZUYUKI
Applicant(s) SANYO ELECTRIC CO LTD
Requested Patent JP63050393
Application Number. JP19860194501 19860820
Priority Number(s).
IPC Classification: C30B23/00 , C30B29/36
EC Classification
Equivalents

Abstract

PURPOSE To obtain the title SiC single crystal having a low content of impurities and high electron mobility by using an SiC polycrystal recrystallized in a high vacuum as the raw SiC material, and subliming the polycrystal to grow an SiC single crystal on the surface of an SiC seed crystal
CONSTITUTION The raw SiC material is sublimed to grow an SiC single crystal on the surface of an SiC seed crystal. In this case, an SiC crystal recrystallized in a high vacuum is used as the raw SiC material

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LIQUID EPITAXIAL GROWTH PROCESS OF SIC SINGLE CRYSTAL

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Inventor(s) MATSUSHITA YASUHIKO
Applicant(s). SANYO ELECTRIC CO LTD
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IPC Classification: H01L21/208 , H01L33/00
EC Classification:
Equivalents

Abstract

PURPOSE. To grow red and blue color light emitting element by means of changing the temperature of Si melt containing Al and N as impurity or light emitting element
CONSTITUTION: A crucible 11 made of high purity graphite is filled with Si melt 13 to immerse a 6HSiC single crystal substrate 1 in the melt 13. Firstly an n type layer 2 is grown on the substrate 1 by means of immersing the substrate 1 in the Si melt 13 respectively doped with 3.5×10^{-4} wt% of n and 0.074 wt% of Al to be held at 1,450 deg C-1,520 deg C. Secondly a p type layer 3 is grown by means of immersing the substrate 1 with the n type layer 2 grown thereon in the Si melt 13 containing 2.54 wt% of Al to be held at 1,450 deg C-1,520 deg.C. Through these procedures, an SiC red color light emitting element is produced. Besides, blue color with light emitting peak at around 460nm may be emitted by means of raising the temperature of Si melt up to 1,600 deg.C.

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GROWTH METHOD OF SiC SINGLE CRYSTAL

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Inventor(s) MATSUSHITA YASUHIKO
Applicant(s) SANYO DENKI KK
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EC Classification
Equivalents

Abstract

PURPOSE To obtain single crystal having good crystallizing property and a small impurity content by shifting an SiC single crystal substrate in an Si melt contg specified elements, separated to high temp zone and low temp. zone and can be heated to elevate its temp in a stage for forming an SiC single crystal having p-n junction.

CONSTITUTION: An Si melt contg Al as p type dopant is charged to a carbon crucible 1 having opened upper surface, and a high temp zone A being elevated to ca 1,650 deg.C at its center and a low temp zone B being at lower temp. than A are provided. About 0.3 deg C/mm. temp gradient is provided to the low temp zone B so that the temp of the melt at the bottom face of the crucible 1 becomes ca 1,630 deg.C. In this state, an SiC single crystal substrate 4 is attached to a jig and immersed in the melt 2 so as to hold the substrate in the low temp zone B and a p type SiC single crystal is grown on the surface of the substrate 4. Then, the substrate 4 is transferred to the high temp zone A and the high temp. zone A is heated simultaneously so as the bottom of the high temp zone A reaches ca 1,700 deg C and the bottom of the crucible reaches ca 1,670 deg C. Thus, Al in the melt 2 is removed by evaporation and the melt 2 is brought to a non-doped condition. Thereafter, N₂ is introduced into the melt 2 and the substrate 4 is transferred to the low temp. zone B, and an n type SiC single crystal is grown on a p type SiC single crystal.

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