VERIFICATION OF TRANSLATION

I, Masako Taylor

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declare that I am well acquainted with both the Japanese and English languages, and that the attached is an accurate translation, to the best of my knowledge and ability, of Japanese Unexamined Patent Application Publication No. H11-67686, published March 9, 1999.

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the above-captioned application or any patent issued thereon.

Signature Masako Taylor Date 3/2/2017

Masako Taylor

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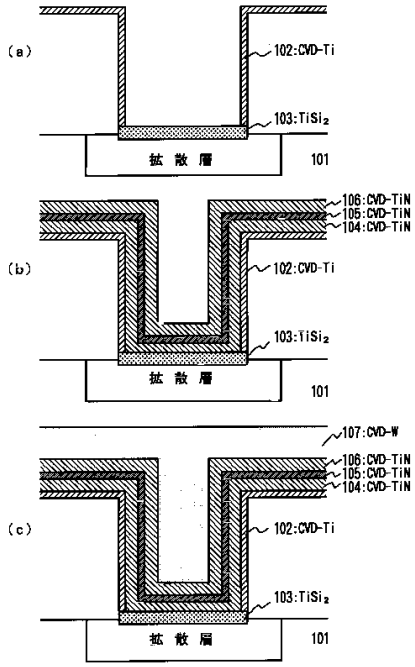
(54) [Title of Invention]

MANUFACTURING METHOD OF SEMICONDUCTOR ELEMENT

(57) [Abstract]

[Purpose] To provide a method capable of manufacturing a semiconductor element having an adhesive layer which does not increase a contact resistance and damage a diffusion layer at low cost in a short time even when a high-temperature heat treatment is performed.

[Solution] A titanium nitride layer constituting an adhesive layer is structured in a multilayer having a first titanium nitride layer 104 to a third titanium nitride layer 106, and by making a second deposition condition which is used to form a second titanium nitride layer 105 different from a first deposition condition used to form the first titanium nitride layer 104 and the third titanium nitride layer 106, grains of the second titanium nitride layer 105 are formed smaller than the grains of the first (and the third) titanium nitride layer 104. According to the manufacturing method, the titanium nitride layer with the grains discontinuously formed is deposited by simply changing the deposition condition temporarily. Therefore, the semiconductor element having above-noted characteristics can be manufactured at low cost in a short time.



[Scope of the Claims]

[Claim 1] A manufacturing method of a semiconductor element comprising: a titanium layer formation process forming a titanium layer having a portion of a diffusion layer contacting a semiconductor element substrate with an opened contact hole turns into silicide; a first titanium nitride layer formation process forming a first titanium nitride layer by a chemical vapor deposition method using a first deposition condition on the titanium layer formed by the titanium layer formation process; a second titanium nitride layer formation process forming a second titanium nitride layer having smaller grains than the first titanium nitride layer by the chemical vapor deposition method using the first deposition condition different from the first deposition condition on the first titanium nitride layer formed by the first titanium nitride layer formation process; a third titanium nitride layer formation process forming a third titanium nitride layer by the chemical vapor deposition method using the first deposition condition on the second titanium nitride layer formed by the second titanium nitride layer formation process; and a wire metal layer formation process forming a metal layer for a wire on the third titanium nitride layer formed by the third titanium nitride layer formation process.

[Claim 2] The manufacturing method of the semiconductor element according to claim 1, wherein the first to the third titanium nitride film formation processes are the process forming the titanium nitride film by the chemical vapor deposition method used together with $TiCl_4$, NH_3, and N_2 gas, and the second deposition condition is the same with the first deposition condition except for the $TiCl_4$ gas flow, and the $TiCl_4$ gas flow is less than the flow under the first deposition condition.

[Claim 3] A manufacturing method of a semiconductor element comprising: a titanium layer formation process forming a titanium layer having a portion of a diffusion layer contacting a semiconductor element substrate with an opened contact hole turns into silicide; a first titanium nitride layer formation process forming a first titanium nitride layer by a chemical vapor deposition method using a first deposition condition on the titanium layer formed by the titanium layer formation process; a reformation process reforming a surface layer of the first titanium nitride film by performing a plasma treatment on the first titanium nitride layer formed by the first titanium nitride layer formation process; a second titanium nitride layer formation process forming a second titanium nitride layer by the chemical vapor deposition method using the first deposition condition on the first titanium nitride layer with the reformed surface layer using the

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