US005849413A

United States Patent [19]

Zhu et al.

[11] Patent Number: 5,849,413

[45] Date of Patent: Dec. 15, 1998

[54] **ORIENTED DIAMOND FILM STRUCTURES ON NONDIAMOND SUBSTRATES**

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[21] Appl. No.: **474,398**

[22] Filed: **Jun. 6, 1995**

Related U.S. Application Data

[62] Division of Ser. No. 282,167, Jul. 28, 1994, Pat. No. 5,449,531, which is a continuation of Ser. No. 062,473, May 17, 1993, which is a continuation-in-part of Ser. No. 973,633, Nov. 9, 1992, Pat. No. 5,298,286.

[51] **Int. Cl.**[6] **C30B 25/02**

[52] **U.S. Cl.** **428/408**; 257/77; 428/212; 428/469; 428/698

[58] **Field of Search** 428/212, 469, 428/408, 698; 257/77

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[57] **ABSTRACT**

A method for making an oriented diamond film includes the steps of saturating a surface region of a transition metal substrate, capable of dissolving carbon, with carbon and hydrogen; forming oriented diamond nuclei on the saturated surface region of the substrate; and growing diamond on the oriented diamond nuclei to form the oriented diamond film. It is theorized that the saturation forms transition metal-carbon-hydrogen surface states ($Metal_x$—C_y—H_z, where x+y+z=1) on the transition metal substrate while suppressing formation of graphite. Diamond may then be deposited onto the oriented diamond nuclei by CVD techniques to thereby form an oriented diamond film on the nondiamond substrate. The nondiamond substrate is preferably a single crystal transition metal capable of dissolving carbon. The transition metal is preferably selected from the group consisting of nickel, cobalt, chromium, magnesium, iron, and alloys thereof. Structures produced by the method are also disclosed and include an oriented diamond film on a nondiamond transition metal substrate.

10 Claims, 11 Drawing Sheets