Sym. A : Silicon Process

ADVANCED MATERIALS IN SEMICONDUCTORS

A-THU-21

SILICON CARBIDE THIN FILMS SYNTHESIZED BY PULSED YAG LASER DEPOSITION, Y. SUDA, H. KAWASAKI, R. TERAJIMA and M. EMURA (Dept. of Electrical Eng., Sasebo National College of Tech., Sasebo, Nagasaki, 857-1193, Japan), K. BABA (Tech. Center of Nagasaki, Omura, Nagasaki 856-0026, Japan), H. ABE (Ceramic Research Center of Nagasaki, Nagasaki, 857-3726, Japan), K. EBIHARA (Dept. of Electrical and Computer Eng., Kumamoto Univ., Kumamoto 860-8555, Japan), S. AOQUI (Dep. of Electrical Eng., Kumamoto Institute of Tech., Kumamoto 860-0088, Japan)

Silicon carbide (SiC) thin films are synthesized by a pulsed YAG laser deposition. The laser beam is incident on the SiC bulk targets. The films are deposited on heated Si (100) substrates using the energy density 3.8 J/cm^2 at a laser repetition rate of 10 Hz. The experiments have been done at different substrate temperature. The SiC films have been characterized by fourier transform infrared spectroscopy (FT-IR), field-emission secondary electron microscope (FE-SEM), Glancing angle X-ray diffraction (GXRD) and Auger electron spectroscopy (AES). AES shows that the almost stoichiometric SiC films are deposited at the methane gas pressure of 10.0 Pa. Measurements of the optical emission spectrum are performed to estimate the processing plasma state.

A-THU-22

VALENCE BAND STRUCTURE OF POROUS SiC, W. SHIN, N. MURAYAMA (NIRIN, 1-1 Hirate-cho, Kita-ku, Nagoya 462 Japan), S. SEO, K. KOUMOTO(Applied Chemistry, Nagoya Univ. Nagoya 464, Japan)

SiC is a wide band-gap compound semiconductor with very promising potential for high temperature, high power and high frequency application in microelectronics and electrooptical devices. It has a large number of polytypes, the cubic 3C and the hexagonal 6H of which seem to be the most important for technological applications. Recently strong blue light-emission from porous SiC (PSC) was reported by the anodization reaction of SiC using HF solution. The luminescence behavior of PSC, however, is somewhat different from that of porous Si in that the so-called blue shift is not observed. Though the QCE is said to be responsible for light emission, the surface state of PSC would play also an important role. The surface of PSC which seems to be an origin of the luminescence had C-H termination on its surface, and the Si-H or Si-O bonds were not detected. In view of the extraordinary application potential, thorough knowledge of the physical properties of SiC polytuypes and their surfaces is a matter of both fundamental interest and technological importance. To calculate the electronic structure of PSC, we should model a cluster considered as bulk 6H-SiC(?) and then design the surface which shows the surface of PSC. The cluster of CSi4C12 was chosen in this study, where we put the C atom at the center and, four tetrahedral Si around this center C then, make the 3 bondings of each Si be terminated by 3C atoms, totally 17 atoms. The DOS plot of the cluster is used for the interpretation of XPS spectra of valence band of SiC.

A-THU-23

BULK MICROMACHINED Z-AXIS GYROSCOPE, S. S. BAEK, G. B. LIM, Y. S. OH(Samsung Advanced Institute of Technology, Suwon, Korea)

We fabricated two types of gyroscope which could measure angular velocity to the perpendicular axis(Z-Axis) to substrate using bulk-micromaching technology. The variation of resonant frequency in driving mode was identical with that of sensing mode since the first type included symmetrical support beam in spite of fabrication error. The second type contained separated support beams for driving and sensing directions to avoid frequency coupling. In fabrication process, 40um silicon diaphram was formed by back side etching and the structure was formed using deep RIE against the other side. Only two masks need to fabricate these gyroscopes. The aspect ratio was about 20:1. As a result of vibration test, for the first type, the difference of two resonant frequencies was about 150Hz in all samples on the wafer. For the second type, the difference was about 300Hz. This difference can be adjusted by electrical tuning. Up to date, real initial capacitance and resolution are about 6.5pF and 0.1deg/sec, respectively.

Sym. H : The Surface, Interface & Nano-structure of Materials

NANO-STRUCTURE

B-THU-01

NANOSCALE INTERACTIONS BETWEEN CRYSTAL INTERFACES, **ALEXANDER H. KING** (Dept. Materials Science & Engineering, State University of New York, Stony Brook, NY 11794-2275, U.S.A.)

The junctions of crystal-crystal interfaces, commonly known as "triple lines" or "triple junctions" are an interesting and challenging area of research. In this paper, we show that these microstructural features can have important effects upon a wide range of materials properties. It will be shown that they possess line energies of similar nature to those of crystal dislocations. The line energies can be position-dependent, and therefore act in a manner similar to the Peierls energy of a dislocation, in particular providing a drag force that resists the motion of the junction. We also show that for very small crystal sizes, the junction structure (and hence energy) are a function of the crystal size. Since triple junctions are sites of excess energy, they can also be sites of chemical segregation, and this is demonstrated in the copper-bismuth system. Finally, we demonstrate that the structures of triple junctions are affected by anisotropy of the energy of the constituent interfaces, and conversely, that the triple junction energy can also affect the inclinations of the interfaces at the junction itself. The implications of these effects for nucleation and growth reactions will be discussed.

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