I. INTRODUCTION

As our ancestors abandoned stones and adopted bronze, human beings are always seeking new materials to satisfy personal curiosities and ambitions and social desires. An invention of a triode vacuum tube in 1906 gave rise to electronics. However, soon peoples found the limitation of size, reliability and power of the vacuum tube. After triode action of Ge in 1948[1], semiconductors, especially Si, have held a leading part of evolution of industries and our lives. Nowadays, we are living surrounded by uncountable semiconductor-devices and computer-aided technology. Needless to say, Si dominates electronics and semiconductor fields. At the same time, other semiconductors hold important parts. Now microwave and optical communications are supported by III-V semiconductor devices. And beside us CD(compact disk) players which need semiconductor lasers can be easily found. Even in the field of a super computer which is one of the symbol of Si technology, a product which uses GaAs IC's(integrated circuit) for its CPU(central processing unit) is announced to ship in 1989[2].

However, still there are many fields where new materials are expected to satisfy needs. Wide-bandgap semiconductors are necessary for high-temperature operation of devices and blue light-emitting devices. IV-IV compound semiconductor SiC treated in this thesis is one of the most hopeful candidates for such uses.

SiC is well known as an example of polytypism. Structure of every polytype of SiC is described by stacking sequence in the [0001] direction*). Atoms occupy one site out of three in the close packed structure. Three sites of A, B and C have the relative arrangement shown in Fig.1. Stacking sequences and bandgaps of popular polytypes are listed in Table 1. Each polytype is described by a number of layers in the repeat distance of a primitive cell and three types of crystal structures. The crystal structures are expressed by H for

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*): See notes at P.7.