

III. GROWTH ON OFF ORIENTED SUBSTRATES

1. Introduction

In this chapter, some attempts to improve grown layers on Si(100) and (111) by the introduction of off orientation are mentioned.

The main interest in the grown layers on (100) is concerned with antiphase domains(APD's). APD's are crystal defects which are observed in compound crystals. Especially, they are often observed in a heteroepitaxially grown crystal with a zinc-blende structure on a (100) face of a crystal with a diamond structure[1-5]. In the case of a zinc blende crystal like 3C-SiC, APD's are defined as follows. Zinc-blende structures consist of two sublattices of a face centered cubic structure. Usually each sublattice consists of atoms of a kind. When these atoms belong to the opposite sublattice in the both sides of some boundaries, the boundaries are called antiphase boundaries(APB's). Domain structures made by APB's are called APD's. A model of APD's(APB's) in a zinc blende structure is shown in Fig.1. In a zinc-blende structure each atom has four bondings with the nearest atoms of the opposite kind. However, APB's consist of bondings with atoms of the same kind as shown in Fig.1. When a crystal containing APD's is observed from [100], [011] direction in one domain is 90° different from that in a adjoining domain separated by APB's. In other words, when grown layers on Si(100) are observed from the upper side, it looks that there are two phases which are rotated by 90° each other.

APB's in semiconductor materials should be eliminated. In the case of epitaxial layers of GaAs on Si, APB's work as origins of lowering of electron mobility[6], roughness of surfaces[6] and recombination centers[7]. In this chapter, the origin and how to eliminate APD's in 3C-SiC are discussed based on various observations. Electrical properties are mentioned in the next chapter.