분과초청 2

In -- situ solid phase epitaxial growth of C49 and C54-$TiSi_2$ on the Si(111)-7×7 substrate

Chi Kyu Choi ; Dept. of Phys., Cheju Nat'l Univ, Cheju 690-756,Korea

The growth of mode of Ti film on the Si(111)-7×7 surface and the solid phase heteroepitaxial growth of Si/C54 $TiSi_2$/Si(111) were investigated by x-ray diffraction, reflection high energy electron diffraction and high resolution transmission electron microscopy. The growth mode of Ti film on Si(111)-7×7 substrate at RT is a Stranski-Krastanov type. The grown Ti film shows polycrystalline but highly oriented to the substrate with an amorphous Ti-Si alloy layer at the Ti/Si interface. Epitaxial C49 and C54-$TiSi_2$ can be grown from the Ti(30ML)/Si(111)-7×7 sample by *in-situ* annealing at 650°C and 750°C for 20min.

When the deposited thickness of the Ti film exceeded 30ML, agglomeration due to grain boundary grooving took place, which resulted the formation of silicide islands. Images of cross-sectional transmission electron microscopy showed that the epi-$TiSi_2$/Si(111) interface was abrupt and no amorphous Ti-Si interlayer is observed, and the surface is smooth. The orientation relationships between epitaxal C54-$TiSi_2$ and Si(111) substrate are determined to be $TiSi_2[\bar{1}\bar{4}1]$//$Si[0\bar{1}1]$, $TiSi_2(202)$//Si(111) whereas those between C49-$TiSi_2$ and Si(111) substrate are $TiSi_2[\bar{2}11]$//$Si[01\bar{1}]$, $TiSi_2(120)$//Si(111) without misorientation angle.

Almost the whole area of the sample was covered with the epitaxial $TiSi_2$ layer of 22 nm thick. We have also shown that high quality double heteroepitaxial epi-Si/epi-C54 $TiSi_2$/Si(111) can be grown by SPE. The matching face relation is Si(111)//$C54(\bar{2}02)$//Si(111) without misorientation angle, which was obtained by deposition of 10ML of Si film on the C54-$TiSi_2$ film at 600°C followed by *in-situ* annealed at 800°C for 10min in UHV.