반응성 금속유기화학증착법에 의한 Si(100)기판위에서 epitaxial $CoSi_2$ layer의 *in situ* 성장

In situ growth of an epitaxial $CoSi_2$ layer on a Si(100) substrate by reactive chemical vapor deposition using a cobalt metallorganic source

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Epitaxially grown $CoSi_2$ has emerged as a leading material of contact metallization for deep submicron devices and nano-devices due to its low resistivity, smooth interface, good thermal stabitity, and shallow junction formation using SADS process. If the supply of Co atoms to the silicide/Si interface is slow enough and the temperature is high enough, the disilicide is likely to be epitaxial because the Co consumption rate is larger than the supply rate. Therefore, it may be possible to grow epitaxial $CoSi_2$ on Si(100) without the use of a diffusion barrier such as TIME and OME methods if the Co supply is lept low enough to avoid nucleation of polycrystalline Co-rich silicdies. Indeed, it .has been reported that $CoSi_2$ can be epitaxially grown Si(100) at 600°C by reactive-deposition epitaxy (RDE). However, this technique requires complicated tools such as MBE not commonly used in silicon processing.

We present a method, which we call reactive chemical vapor deposition epitaxy (RCVDE), for the in situ formation of epitaxial $CoSi_2$ layers on a (100) Si substrate. CVD commonly used in the silicon process offers several advantages, such as a uniform conformal deposition over a large area an no substrate damage. It also can control the deposition rate in a relatively broad range. For this purpose, the Co deposition rate during deposition on a heated Si(100) substrate was controlled by MOCVD. Among the cobalt metallorganic sources, cyclopentadienyl dicarbonyl cobalt was selected due to its deposition ability at temperatures above 600°C.

Uniform epitaxial $CoSi_2$ layers have been grown in situ on a (100) Si substrate at temperatures above 600°C by RCVDE. Co-rich phases such Co_2Si and CoSi were suppressed during cobalt MOCVD at substrate temperatures above 500°C. An ion channeling minimum yield of 8% in RBS has been achieved in the epitaxial layer, indicating a nearly perfect epitaxial order.