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Thermal stability and the formation mechanism of the interfacial layer between WNx/Si(100)

I. S. Choi, J. C. Park, J. T. Choi, H.·J. Kim, S. Y. Lee
Hynix Semiconductor Inc.

A poly-metal gate composed of W/WNx/poly-Si or denuded-WNx/poly-Si gate is the most promising candidate for a low resistive gate in the deep submicron ULSI(1,2). In these cases, it has been reported that there exists the interface layer between WNx/poly-Si and its thickness increase as the annealing temperature does. It has been known that the interface layer plays a role as a barrier against silicidation up to 1000 ℃. But the layered structure of the interface and the mechanism of the barrier formation are not clear yet. By using XRD, HRTEM, and ARXPS, we investigated the chemical bonding states and the formation mechanism of interfacial layer between WNx/Si(100) using chemical wet etching. We observed that the multi-layer structure of the systen is W/Si-oxide/SiON/nanoparticle-WSi2/Si(100). The thickness and the layered structure of the barrier are varied as the annealing temperature increases up to 1000 ℃. The formation mechanism of the interfacial layer will be discussed in this presentation.

1 Y.Akasaka, etc, IEEE Trans. Electron Devices 43, 1864 (1996)
2 B.H.Lee, etc, Appl. Phys. Lett. 76, 2538 (2000)