
Titanium and Cobalt Etching by SC1 and SC2 in VLSI Technology

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Abstract

Cobalt disilicide (CoSi_2) is widely used in very large scale integrated (VLSI) technology. After the formation of CoSi_2 by a thermal reaction, two unreacted metal layers, Titanium (Ti) over Cobalt (Co), are remained on top of the CoSi_2 . Those two layers must be removed without any damages occurred on CoSi_2 properties underneath. Wet etching is a suitable method to meet this challenge. A study in a wide range of experimental parameters was carried out on Mattson OMNITM system, a wet tool for etching and cleaning, with its standard RCA chemicals. It was started on single subtract etching by chemicals to evaluate various etching rates and etching selectivities and, then on device wafers to evaluate their electric properties. A process was developed with reasonable etching rates, good etching selectivities and a good quality of CoSi_2 . This process is SC1 (volumetric ratio, 50:1:1 of DI: NH_4OH : H_2O_2 , 50°C) to remove Ti, then followed by SC2 (100:1:1 of DI: HCl : H_2O_2 , 40°C) to remove Co. Device wafers after this process were investigated and past standard electronic failure tests.