PACS: 84.32.Ff

Ion formation of metal silicide films

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Received July 27, 2022

The possibility of forming metal silicide films by ionic methods, implemented using ion-plasma sputtering in a device based on a Penning discharge, as well as by a combination of methods of thermal evaporation of metals in high vacuum assisted by a silicon ion beam, has been studied. The mechanism of formation of silicide films on various substrates at a relatively low temperature of the substrates up to 300 ^{o}C under conditions of limited exposure to plasma has been established. Experimental samples were based on Mo, W, W-Re, Ti silicides in a wide range of resistances (20–600 Ohm/□) and TCR (less than 10^{-4} deg^{-1}), which allows them to be recommended as a conductive and resistive layers for of micro- and nano-electronics devices. The parameters of the methods assisted by ion beams were determined by modeling the processes of ion implantation, titanium deposition, taking into account sputtering, and subsequent experimental testing of the modes in the preparation of titanium silicide films. Upon annealing at 700 ^{o}C, the resistance of the samples decreased to 1.6 Ω/□ and the composition was close to that of titanium disilicide, which makes it possible to recommend the developed ion methods in CMOS technologies.

Keywords: metal silicide, ion-beam assistance, CMOS, low-temperature process, silicide formation.

DOI: 10.51368/1996-0948-2022-6-68-75

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