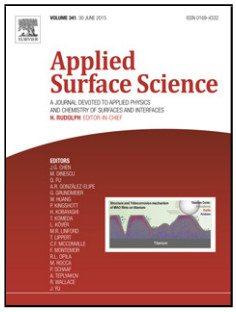

Title: The effect of Ni:Si ratio on microstructural properties of Ni/Si ohmic contacts to SiC

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Highlights:

– Ni/Si multilayer structures were deposited on 4H-SiC and subjected to the annealing

– microstructure of Ni silicide layers was characterized

– strong effect of initial Ni:Si ratio on ohmic contact's microstructure was observed

– mechanisms influencing silicide-layer's microstructure were discussed

The effect of Ni:Si ratio on microstructural properties of Ni/Si ohmic contacts to SiC

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Abstract. Detailed microstructural studies were performed on Ni/Si ohmic contacts to silicon carbide in order to investigate the effect of initial Ni:Si ratio in as-deposited structures on the occurrence of characteristic defects in Ni silicide layers, like voids, layer discontinuities, rough surface or rough interface. The chosen range of investigated Ni:Si ratios corresponded to δ-Ni_2Si as a dominant phase after complete annealing sequence. Strong effect of the initial stoichiometry on the ohmic contact's microstructure was observed. The highest Ni concentration significantly lowered the temperature at which roughening of the surface and the interface occurred. The middle value of investigated concentrations resulted in the rough interface after high temperature annealing, while the lowest investigated Ni content preserved smooth interface but introduced large voids and layer discontinuities. After the first annealing step, γ-$Ni_{31}Si_{12}$ and/or δ-Ni_2Si phases were detected. In the ohmic contacts (after two-step annealing sequence), beside δ-Ni_2Si, the metastable, high temperature phase ϑ-Ni_2Si was detected (also referred to as Ni_3Si_2.h). This phase can exist within a relatively broad range of Ni:Si stoichiometry. The stoichiometry change toward higher Si content, which occurs during high temperature annealing, was realized through this phase. Superstructures were detected in ϑ-Ni_2Si

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