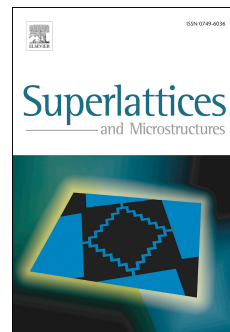


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Optimization of Ohmic Contacts on Thick and Thin AlGaIn/GaN HEMTs Structures

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Abstract: In this paper, we address the Ohmic contacts comparison and optimization on both thin (18 nm) and thick (25 nm) AlGaIn/GaN HEMTs structures. In the conventional metallization scheme of Ti/Al/Ti/Au, several stacks based on Ni, Cr, and Pt metals replacing the middle Ti were tested and compared. Specific Contact Resistance (ρ_c) strongly depends on the stack ratio. For a particular, stack ratio of 1:5:2:3 tested on thick AlGaIn based HEMTs, Cr stack exhibited the least ρ_c value of $5 \times 10^{-5} \Omega\text{-cm}^2$ while the ρ_c value doubled for Pt and increased by 4 times for Ni. But the morphology comparison shows that Ni is the best choice. Therefore the Ni-based stack was further optimized for low contact resistance. In the optimization process, pre-metallization surface treatments were altered along with the stack ratios. The stack ratio of 1:5:2:2.5 has resulted in lowest specific contact resistance value of $6 \times 10^{-6} \text{ ohm-cm}^2$. Different Ni-based stacks with ratio variations were then deposited and compared for thick and thin AlGaIn/GaN HEMTs structures. The same value of ρ_c was recorded on both thick and thin structures as long as the Ni proportion in the stack is low. With an increase in the Ni proportion, ρ_c was found to be increased dramatically for thin AlGaIn/GaN HEMTs.

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