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Effect of annealing temperature on the morphology of ohmic contact Ti/Al/Ni/Au to *n*-AlGaIn/GaN heterostructures

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Keywords

ohmic contacts, heterostructure, AlGaIn/GaN heterostructure, Ti/Al/Ni/Au

Abstract

Ohmic contacts to AlGaIn/GaN heterostructures which have low contact resistance and good surface morphology are required for the development of high temperature, high power and high frequency electronic devices. One of the keys to the advancement of such devices is the understanding of ohmic contacts formation to epitaxial aluminium gallium nitride layers. The paper presents the investigation of Ti/Al/Ni/Au based ohmic contact to *n*-AlGaIn/GaN heterostructures grown by LP-MOVPE technique. Multilayer metallization of Ti/Al/Ni/Au with thicknesses of 10/100/40/150 nm, respectively, was evaporated by an electron gun (Ti, Ni) and resistance heater (Al, Au). The contacts were annealed at RTA (rapid thermal annealing) system in nitrogen ambient atmosphere over the temperature range from 775 °C to 850 °C. The time of annealing process was 60 seconds. The morphology of Ti/Al/Ni/Au ohmic contacts to *n*-AlGaIn/GaN heterostructures was studied as a function of the annealing process conditions by an optical microscope and AFM (atomic force microscope). Simultaneously, the electrical parameters of Ti/Al/Ni/Au ohmic contacts were studied as a function of the annealing process conditions by the current-voltage (*I*-*V*) method on dedicated test structures. The characteristic resistances of the Ti/Al/Ni/Au/*n*-AlGaIn/GaN ohmic contacts were evaluated from the circular transmission line method (CTLM). The formation and deterioration mechanisms of the ohmic contacts to *n*-AlGaIn/GaN heterostructures were studied. One of the mechanisms of agglomerates enlargement during the thermal annealing of Ti/Al/Ni/Au metallization has been proposed.



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