Electrodeposition of copper onto n-GaN

A. S. Huyghebaert, K. Strubbe
Universiteit Gent, Laboratorium voor Fysische Chemie, Krijgslaan 281, B-9000 Gent, Belgium

GaN is a wide band-gap semiconductor that is of interest in optoelectronic applications and for high power and high temperature electronic devices. For these devices metal/semiconductor contacts are very important. Generally these contacts are formed by evaporation techniques, although electrodeposition may provide an alternative and cheaper method, sometimes leading to contacts with better qualities as compared to junctions made by a gas phase process.

In the past it has been shown that the condition of the semiconductor surface is important with regard to the characteristics of the barrier formed[1]. As the surface in an electrodeposition process can be controlled by e.g. varying the electrolyte solution or the potential, an electrochemical study of the deposition process may lead to a better understanding of the barrier formation.

In this work, the results of a study of the electrochemical formation of Cu/n-GaN contacts are reported. Copper was chosen as the metal because it is widely used for the production of metallic thin films, due to its good resistivity characteristics (low resistivity and high electromigration resistance)[2,3]. Moreover copper has the experimental advantage that it can be dissolved chemically without damaging the n-GaN surface.

The electrochemical behavior of n-GaN was studied by means of rotating disc voltammetry and cyclic voltammetry. Chronoamperometric measurements were performed to gain information about the nucleation process and the results were compared with the results of SEM-experiments taken after deposition at various potentials. n-GaN/Cu-contacts were made. Kinetics and mechanism of the deposition process and the qualities of the deposited layer are discussed.

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