Study of the effectiveness of anodic films as surface passivation for InAsSb mid-wave infrared HOT detectors

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The quality of the surface have a strong influence on detector performance. Unfortunately during the processing of the $A^{III}B^{V}$ heteroepitaxial structures the sidewalls of mesa are exposed to aggressive environment and ambient atmosphere, leading to the formation of thin native antimony, indium and arsenic oxides layer [1-3].

Some of these oxides are conductive in nature, creating a surface leakage path which contribute to increase dark current. Moreover, charged ions from the atmospheric might be incorporated in the newly formed oxide layer which adds to the surface leakage current through band bending near surface. Nonstechiometric composition of the surface and ability of react with air contaminates can results in formation of the additional interfacial states. Interface states can trap carriers thereby disrupting normal $A^{III}B^{V}$ device operation [4][5].

Optimum mesa surface passivation become an absolute necessity to enhance the performance of $A^{III}B^{V}$ photodiodes. The purpose of passivation is to saturate the active surface states(dangling bonds) which were arisen during the mesa etching.

In present work we would like to demonstrate the influence of different anodic films growth in electrochemical cell on dark current densities of mid wave infrared HOT detectors in accelerated stability studies. The quality of the surface is investigated by XPS measurements

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