PERGAMON

Vacuum 65 (2002) 185–191

VACUUM
SURFACE ENGINEERING, SURFACE INSTRUMENTATION & VACUUM TECHNOLOGY

www.elsevier.com/locate/vacuum

The study of $InPO_4$/InP(1 0 0) by EELS and AES

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Received 1 June 2000; received in revised form 20 April 2001; accepted 2 May 2001

Abstract

Auger electron spectroscopy and electron energy loss spectroscopy (EELS) have been used to characterize the oxide $InPO_4$ whose thickness is about 10 Å as grown on the substrate InP (1 0 0). The behaviour of the surface was studied following either electron irradiation or heating in UHV. The high sensitivity of the EELS, showed a structural change of the surface after irradiation with electrons of 5 keV energy, $InPO_4$ being sensitive to the electron beam. However, this surface oxide appeared to be stable when heated in UHV at 450°C.

1. Introduction

The III–V semiconductor materials are of great importance in the field of electronic and opto-electronic technology, being of particular interest because of their high electronic mobility. Unfortunately, many problems have been reported by different authors concerning for example, the electrical instabilities of devices of MIS type (metal/insulator/semiconductor). In general, the initial state of the surface is suspected to be at the origin of these problems and in particular the presence of impurities or defects on the surface. As we have previously reported in agreement with other authors, the cleaning of InP(1 0 0) or InSb(1 0 0) by argon ion bombardment allows the removal of a contamination layer composed of carbon and oxygen from the surface. The studies showed that there appeared to be an excess of indium on the surface, the stoichiometry of the InP (1 0 0) compound is broken and phosphorus is desorbed from the surface leaving an excess of indium in the form of metallic indium on the surface [1–3]. Since such a cleaning procedure of the compound has some disadvantages, it would be worthwhile to find a means to protect the InP(1 0 0) surface from all contamination while it is exposed to the atmosphere. Hence an oxide such as $InPO_4$ has been grown on InP(1 0 0) by UV radiation, its chemical nature being identified by XPS. The aim of this study was to characterize this layer of $InPO_4$ whose thickness is of the order of 10 Å by using different spectroscopy methods, in this case Auger electron spectroscopy (AES) and the electron energy loss spectroscopy (EELS). The effect of the irradiation of the $InPO_4$/

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0042-207X/02/$ - see front matter
PII: S0042-207X(01)00480-8