Surface Analysis and Manipulation of Gallium Arsenide

Lindell Ward,[1] Madhivanan Muthuvel[1] and John Stickney[1]

[1]University of Georgia
Department of Chemistry
Athens, GA 30602
USA

Formation of compound semiconductors by electrochemical methods has been well demonstrated by a large number of research groups. These semiconductors are usually plated onto a metal substrate, typically gold, silver, titanium, nickel, or stainless steel. Electrochemical growth of both II-VI and III-V compound semiconductors onto a semiconducting substrate is highly desirable. Gallium arsenide could be an excellent substrate if its solution chemistry can be understood and controlled.

Using ultra-high vacuum (UHV) surface analysis techniques, the capability of using gallium arsenide as a substrate is being examined. Electrochemically assisted etching schemes are being developed to control surface structure, morphology and stoichiometry. The goal is to produce a single crystal quality gallium arsenide surface, in solution, that is free of oxides and carbon containing species. Once this surface is obtained, studies of compound semiconductor electrodeposition onto the GaAs substrate will be performed using a technique known as electrochemical atomic layer epitaxy (EC-ALE). Compound semiconductors, such as ZnSe, CdTe, and InAs, are ideal candidates for electrodeposition onto GaAs.