

**STUDIES OF Ga 3D STRUCTURES GROWN ON Au/Si SUBSTRATE BY MOCVD. (1) Pillis, M.F. (2) Chiaramonte, Th. (2) Lacroute, Y. (2) Josse-Courty C. (2) Sacilotti, M.** (1) Instituto de Pesquisas Energéticas e Nucleares. Av.Prof.Lineu Prestes, 2242. 05508-000 São Paulo, Brazil. (2) FR 2604 CNRS Université de Bourgogne. 9, Av Alain Savary, 21078 Dijon, France. Email: mfpillis@ipen.br

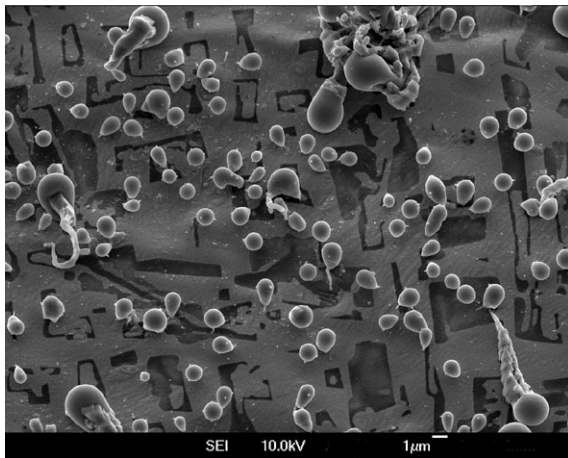
In the last years, nanoscience has received special attention and the development of nanosized materials and microsized devices became very important for future applications in technological areas. New growth mechanisms and new ways to obtain three-dimensional (3D) micrometer/nanometer size structures can help in the development and improvement of future photonic materials and devices (1). Visible light materials/devices having nanosized/microsized dimensions and more efficient optical quantum properties are important (2). In particular, the GaN family is of great interest for optoelectronic materials (3). This paper concerns the development of three-dimensional (3D) structures for visible light materials/devices applications. These structures after being submitted to an annealing treatment in ammonia atmosphere in order to get GaN structures can be used in visible light devices applications (4, 5). The substrate Si (100) was cut to size and cleaned in a 6:1:1 H<sub>2</sub>SO<sub>4</sub>:H<sub>2</sub>O<sub>2</sub>:H<sub>2</sub>O solution and rinsed in abundant deionised water. After that Au particles were lay down on this substrate. The growth was carried out in multisource vertical LP-MOCVD equipment. This system is essentially composed of a heated reaction chamber, a vacuum system, and a metal-organic precursor. The deposit was carried out for 15 minutes at 700°C under 700 torr of pressure. The precursor used was Ga(CH<sub>3</sub>)<sub>3</sub> and the carrier gas was nitrogen. The surfaces of specimens were examined in a scanning electron microscope (SEM) and the composition of the obtained products was determined by using energy dispersive analysis (EDS). The surface of the specimen contains dark and light regions, and some like-balloon structures as it is shown in Fig. 1a. Fig. 1b shows these like-balloon structures in a higher magnification. These structures grown perpendicularly to the substrate. EDS analysis is shown in Fig. 1c and revealed that these structures are composed of Ga. The Al detected concerns to the sample holder used in the SEM analysis. EDS analysis in dark regions revealed that both Au and Si were present, Fig. 1d. In the other hand, in light regions, only Au was detected, Fig 1e. This fact suggests that dark regions could be a phase formed by Si and Au. In both phases Ga was detect probably as little size balloons that were grown up on the substrate. Based on the results shown so far, it can be stated that a conventional LP-MOCVD system using trimethylgallium as precursor can be used to grow 3D micrometer size balloon-like structures perpendicularly to the surface of a metallic substrate.

### **Acknowledgements**

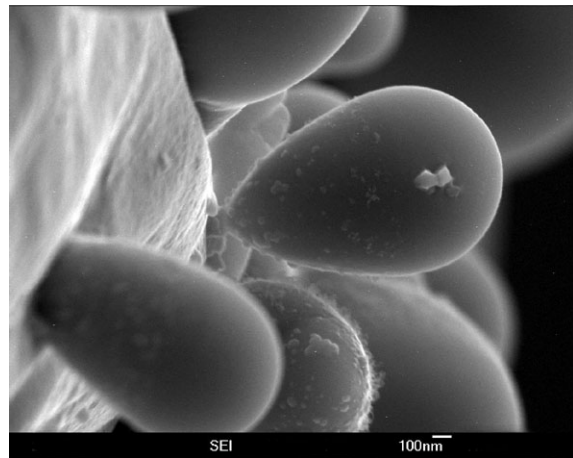
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## References

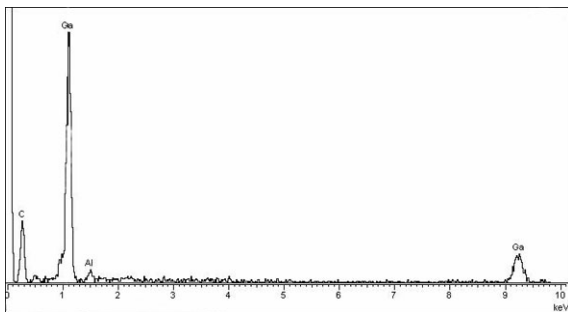
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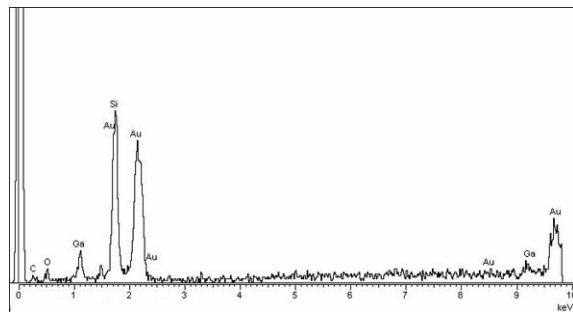
(a)



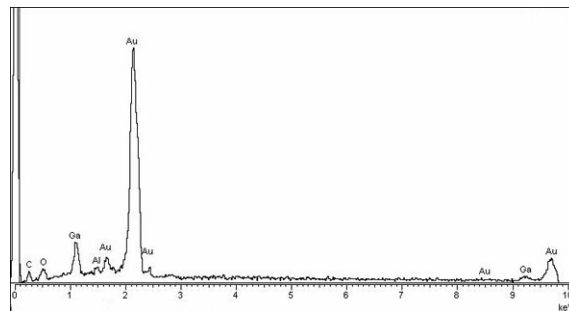
(b)



(c)



(d)



(e)

Fig.1: Ga deposit on Si/Au substrate. (a) general view of the surface; (b) Ga balloons; (c) EDS on Ga balloons; (d) EDS on dark region; (e) EDS on light region.