

## **PRODUCING PASSIVATION AND ANTI-REFLECTION (ARC) COATING ON GAAS BY A SIMPLE AND SCALABLE METHOD**

Zahra Sadat Jahanshah Rad<sup>1</sup>, Mikko Miettinen<sup>1</sup>, Johanna Laaksonen<sup>1</sup>, Pekka Laukkanen<sup>1</sup>, Kalevi Kokko<sup>1</sup>

<sup>1</sup> University of Turku

GaAs has many applications in optoelectronic devices such as solar cells, photodetectors and diodes. Coating GaAs with passivation and Anti-reflection coating (ARC) is necessary to reduce the electrical and optical losses and to increase efficiency of devices made of GaAs. Among different methods to reduce optical losses on GaAs, growing nanostructures on the surface is also developed<sup>1-4</sup>.

In this work we have developed a simple, low-cost, scalable and environmentally friendly method to produce passivation/ARC layers on GaAs by immersing GaAs into hot hydrogen peroxide and hot water.

GaAs surface changes to black after this treatment is applied. The results show that a passivation/ARC layer is formed on the surface of GaAs which increases photoluminescence (PL) intensity and reduces reflectance from the surface of GaAs.

Scanning electron microscopy (SEM) and transmission electron microscopy (TEM) results show formation of a thin layer of oxide nanocrystals on the surface after the treatment. The XPS results from the surface of the black GaAs and GaAs with native oxide are shown in the figure. Ga 3d and As 3d peaks shift toward higher binding energies showing oxidation of Ga and As on the surface of black GaAs.

In this work we utilized XPS to study chemical state and composition of black GaAs surface which is produced by immersing GaAs into hot hydrogen peroxide and hot water. The results show formation of a thin oxide layer on the surface that reduces optical and electrical losses.