CHARACTERIZATION OF HIGH-SENSITIVITY INAS THIN-FILM MICRO-HALL SENSOR WITH MAGNETIC NANOPARTICLES ADDED ON THE SENSOR SURFACE FOR POSSIBLE APPLICATION IN BIOMEDICAL DETECTION

Jesús Molinar Díaz\textsuperscript{a}, Carlos A. Martínez Pérez\textsuperscript{a}, Imelda Olivas Armendáriz\textsuperscript{a}, Claudia Rodríguez González\textsuperscript{a}, Jonathan R. Reyes Moya\textsuperscript{a}, Erika Fuentes Fernández\textsuperscript{b}, Manuel Quevedo López\textsuperscript{b} and Perla E. García Casillas\textsuperscript{a}

\textsuperscript{a}Instituto de Ingeniería y Tecnología, Universidad Autónoma de Ciudad Juárez, Ave. Del Charro #610 norte, Col. Partido Romero, C.P.32320, Cd. Juárez Chihuahua, México

\textsuperscript{b}Department of Materials Science and Engineering, University of Texas at Dallas, Dallas 151-747, USA

As diseases can be detected at the cell or molecular level, many diseases can be diagnosed at very early stages, much earlier than the disease symptoms appear. This is especially important for some fatal diseases, such as cancer. Conventional cancer diagnostic tests, including computed tomography, biopsy, endoscopy, and blood tests are limited due they do not provide information about the disease development at an early stage.

Magnetic biosensors have been under exhaustive investigation due their great advantages in biomedical detection. Galvanomagnetic effects are widely used in magnetic sensors: the Hall Effect and magnetoresistance. Hall Effect sensors provide significant benefits due their compatibility with microelectronics and they usually detect the stray magnetic fields of magnetic nanoparticles which are attached to biological entities. It is necessary to study a high-sensitive semiconductor material for magnetic field detection devices development to enhance early detection, low-cost, reliable and fast response. InAs semiconductor thin-film has potential electromagnetic properties to enhance magnetic nanoparticles detection in biomedical applications.

In this research, we analyzed chemical, morphological, and electrical properties of InAs thin-film with magnetic nanoparticles physically added on its surface by different characterization techniques as: UV-Vis, SEM, DRX and 4-point probe. Magnetic nanoparticles employed are comparable to biological molecules dimensions of interest. In the future, Hall measurements will be performed and the stray magnetic field, Hall coefficient, and mobility will be analyzed. This sensor has the purpose to be functionalized for magnetic nanoparticles detection in biomedical applications.

Keywords: Hall Effect sensor, InAs semiconductor, Magnetic nanoparticles

References:


Presenting author’s email: a113015@alumnos.uacj.mx