



Project Title:	<i>Graphene and nanodiamond hybrids for electronic applications</i>
Project Short description	<p>The development of hybrid structures composed of different allotropes of carbon has recently raised a high scientific interest. The integration of different carbon nanomaterials will lead to unique properties as a result of the synergy between the properties of each phase, paving the way for applications. This project aims to achieve the simultaneous growth of graphene and nanodiamond, thus forming a new carbon-on-carbon hybrid material based on the planar technology sp^3 over sp^2. The possibility of simultaneously forming a conductive layer (graphene) on a substrate of high dielectric constant and excellent mechanical properties (diamond) can prove to be key for electronic applications. In addition to directly grow graphene on its native dielectric, this approach avoids using a PMMA temporary substrate which is one of the major drawbacks in the current graphene technology.</p> <p>Simultaneous synthesis of graphene and diamond will be done by chemical vapor deposition using thermal activation of the precursor gases or microwave plasmas. The challenge is to find conditions for the synthesis allowing simultaneously growth of the two carbon nanostructures in a controlled way. The nanomaterials produced will be characterized by electron microscopy and Raman spectroscopy, and used to fabricate field-effect transistors (GFETs). Electrical transport properties of the devices will be compared to those obtained in standard GFETs that use SiO_2 as the gate dielectric. In this context the possible modulation of the band gap of graphene through the density and size of the nanodiamond clusters will be explored.</p>
Expected Start/end date	February 2015 / July 2015
Required degree and Background knowledge of students, minimum grade point average, etc...	The successful Fellow is highly motivated and interested in science, and willing to work in a team. She/He is expected to have a background in applied physics, materials engineering or related field. Familiarity with chemical vapor deposition, electronic device physics and/or electrical measurements is of advantage.

Supervisor at INL

Name:	Pedro Alpuim
Position:	Associate Researcher, Nanoelectronics group
email:	pedro.alpuim.us@inl.int