FABRICATION AND CHARACTERIZATION OF PHOTONIC CRYSTALS INFILTRATED WITH SINGLE WALL CARBON NANOTUBES FOR NEW OPTOELECTRONIC DEVICES

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Single wall carbon nanotubes (SWCNTs) are promising nanostructures for optoelectronic applications, due to their semiconducting behaviour that shows a electronic bandgap around 0.8 eV (1.5 μm)[1]. High purity SWCNTs (~66%) have been encapsulated using an specific procedure developed at the Universidad de Vigo and based on the works of O'Connell and Smalley[1]. The absorption spectrum of the SWCNTS diluted in deuterium oxide D_2O has been measured (Fig.1a) showing very similar features than what shown in Ref. 1. Optical emission of the SWCNTs has been performed by photoluminescence spectroscopy at room temperature of the diluted SWCNTs for volumes ~1 ml and smaller (Fig. 1b). The spectra show different maxima in the range 800-1700 nm that correspond to the different families of SWCNTs that differ in size and quirality. Two dimensional photonic crystals based on a triangular lattice of holes in dielectric have been infiltrated with the solutions of D_2O-SWCNTs and their optical emission has been measured, showing enhancement of the luminescence for specific wavelengths, which can allow the control of optical properties of SWCNTs and pave the way to their use in new optoelectronic devices.

[1] Michael J. O'Connell et al., "Band Gap Fluorescence from Individual Single-Walled Carbon Nanotubes" Science 297, (2002)

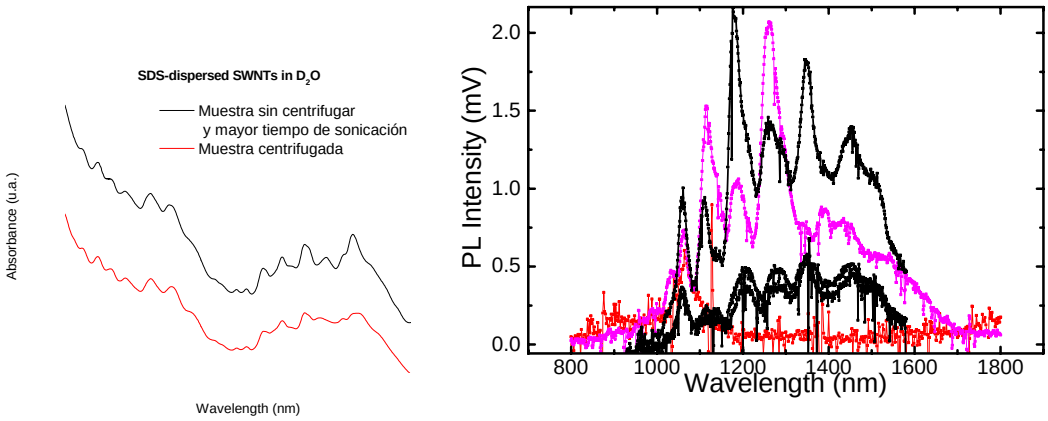

Fig.1. Left: Spectra of the absorption of the SWCNTs diluted in D_2O for different sonication times. Right: Room temperature photoluminescence spectra showing the emission of the SWCNTS in D_2O.