



SEMINARIO

Femtosecond laser written diamond photonics

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Diamond is a promising platform for sensing and quantum processing owing to the remarkable properties of the nitrogen-vacancy (NV) impurity [1]. An important breakthrough would be in connecting, using waveguides, multiple diamond NVs together optically. However, it still has to be established an efficient photonic fabrication method for diamond similar to the photolithographic methods that have revolutionized silicon photonics. In this talk I will explain the optical waveguides in diamond inscribed by focused femtosecond high repetition rate laser pulses [2,3]. Employing μ Raman spectroscopy, optically detected magnetic resonance and confocal μ Photoluminescence characterization, I show that the properties of NV centers already present within the laser-written optical waveguides were preserved. In addition, I show the possibility of creating vacancies in bulk diamond using femtosecond laser single pulses, to produce the NV centers after annealing. These diamond waveguides and NV centers are promising for integrated magnetometer or quantum information systems on a diamond chip [4].

[1] I. Aharonovich *et al.*, Diamond Photonics, Nat. Phot. 5, 397–405 (2011)

[2] B. Sotillo *et al.* Diamond photonics platform enabled by femtosecond laser writing, Scientific Reports 6, 35566 (2016) .

[3] B. Sotillo *et al.* Polarized micro-Raman studies of femtosecond laser written stress-induced optical waveguides in diamond. Applied Physics Letters, 112(3), 031109 (2018).

[4] J.P. Hadden *et al.* Integrated waveguides and deterministically positioned nitrogen vacancy centers in diamond created by femtosecond laser writing. Optics letters, 43(15), 3586-3589 (2018).

