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Splitting of photoluminescent emission from nitrogen–vacancy centers in diamond induced by ion-damage-induced stress

P Olivero[1,2,3,7], F Bosia[1,2,3], B A Fairchild[4], B C Gibson[4], A D Greentree[4,5], P Spizzirri[4,6] and S Prawer[4]

[1] Physics Department and 'Nanostructured Interfaces and Surfaces' Centre of Excellence, University of Torino, Via P Giuria 1, I-10125 Torino, Italy
[2] Consorzio Nazionale Interuniversitario per le Scienze Fisiche della Materia (CNISM), Via della Vasca Navale 84, I-00146 Roma, Italy
[3] Istituto Nazionale di Fisica Nucleare (INFN), Sezione di Torino, Italy
[4] School of Physics and Melbourne Materials Institute, University of Melbourne, Victoria 3010, Australia
[5] Applied Physics, School of Applied Sciences, RMIT University, Victoria 3001, Australia
[6] The Melbourne Centre for Nanofabrication, Victoria 3168, Australia
E-mail: paolo.olivero@unito.it

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Abstract. We report a systematic investigation on the spectral splitting of negatively charged, nitrogen–vacancy (NV^-) photoluminescent emission in single-crystal diamond induced by strain engineering. The stress fields arise from MeV ion-induced conversion of diamond to amorphous and graphitic material in regions proximal to the centers of interest. In low-nitrogen sectors of a high-pressure–high-temperature diamond, clearly distinguishable spectral components in the NV^- emission develop over a range of ~4.8 THz corresponding to distinct alignment of sub-ensembles which were mapped with micron spatial resolution. This method provides opportunities for the creation and selection of aligned NV^- centers for ensemble quantum information protocols.

[7] Author to whom any correspondence should be addressed.