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*Submission of our manuscript “Optical detection of paramagnetic defects in a CVD grown diamond”.*

Dear Editors,

Please find enclosed our manuscript *“Optical detection of paramagnetic defects in a CVD grown diamond”* which we submitt for consideration as a rapid communication in Physical Review B.

The spin of atoms or defects in crystals are widely employed for performing many modern spectroscopic, quantum informatic as well as quantum sensing tasks.

In particular, the electronic spin of Nitrogen Vacancy centers (NV centers) in Chemical Vapor Deposition (CVD) grown diamonds is an ideal probe of magnetic fields and temperature, as well as an ideal qubit for quantum information processing.

The main reason is that NV spins present the unique feature of being optically polarizable at room-temperature and with a very long lifetime. Studying and controlling the magnetic environment of NV centers in such high purity crystals is thus essential. Thus far however, only Electron-paramagnetic-resonance (EPR) was capable of detecting paramagnetic defects in CVD grown materials.

In this study, we optically detect scarcely studied paramagnetic species in a CVD grown diamond, such as hydrogen-related complexes, by coupling them to NV centers. The resonant transfer of the polarized electronic spin of the NV centers to the spins of these defects generates novel spectral features in the NV photoluminescence.

Our results offer prospects for more detailed studies of CVD grown processes as well as for coherent control of the spin of a novel class of hyper-polarized paramagnetic species.

Best regards,

Gabriel Hétet, on behalf of the authors.