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Spin Defects in hexagonal Boron Nitride for Sensing Applications

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Two-dimensional materials have emerged as the new playground for quantum photonics devices. Among them, hexagonal boron nitride (hBN) is an interesting candidate due to its ability to harbor optically active defects generating single photons. In recent years, the negatively charged boron vacancy defect in hBN caught attention for their sensitivity to environmental parameters such as magnetic field, temperature, and pressure, making it interesting for quantum sensing. Although other spin defects have been discovered in hBN, this spin-1 color center remains the only one whose structure has been unambiguously elucidated. Finally, sensing applications of spin centers require identification of the radiative and non-radiative relaxation pathways from the excited triplet states to the ground triplet state, particularly the one via an intermediate state (IS). In my talk, I will also discuss the relaxation dynamics of the IS in the optical pumping cycle in a broad temperature range.