Electrical excitation of carbon centers in hexagonal boron nitride

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Hexagonal boron nitride (hBN) has emerged as a focal point in diverse research areas, and its significance in optoelectronics has been underscored by the incorporation of carbon. This addition introduces spectroscopic signatures reminiscent of nitrogen-vacancy centers in diamond, maintaining stability even in films characterized by atomic thickness. Notably, this has paved the way for the creation of surface solid-state quantum emitters.

In the seminar, we will explore the systematic developments in creating and characterizing thin layers of carbon-doped hBN, presenting a pathway toward enhanced functionality and possible applications. Utilizing the realm of van der Waals materials, we engineer precise device structures, enabling control over carrier dynamics and defect-related tunneling pathways. Consequently, the carbon centers can be excited electrically in vertical tunnelling junctions. Additionally, the interplay between the Stark effect and the effective dielectric screening allows tunability of their optoelectronic properties.