

Magnetic exciton in van der Waals NiPS3: Puzzles

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NiPS3 was among the first van der Waals magnets to be exfoliated down to a monolayer in 2016 [1] and remains one of the most intriguing members of this class. Notably, it hosts an exceptionally narrow magnetic exciton below its antiferromagnetic ordering temperature of 155 K [2]. This exciton has been proposed to originate from a transition between two quantum-entangled states—the Zhang-Rice triplet and Zhang-Rice singlet—while also exhibiting a remarkable polarization. Despite extensive experimental confirmation of these observations by multiple groups, the precise microscopic mechanism underlying the exciton formation remains a topic of active debate. In this talk, I will present recent experimental data and theoretical insights that help unravel the nature of this exciton. Our latest findings resolve many of the open questions surrounding the magnetic exciton in NiPS3, shedding new light on its fundamental properties.

[1] Cheng-Tai Kuo, et al., *Scientific Reports* 6, 20904 (2016)

[2] Soonmin Kang, et al., *Nature* 583, 785–789 (2020)