

Zhang-Rice excitons in 2D van der Waals antiferromagnets

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Highly unusual exciton dynamics in two-dimensional van der Waals antiferromagnets is reported based on optical spectroscopic measurements performed on NiI_2 and NiPS_3 . Dramatic formations of Zhang-Rice excitons have been discovered in the near-infrared and visible regions. These exciton states are generated by a strong hybridization between the metal d- and the ligand p-orbitals. The ultra-narrow absorption peaks are attributed to transitions from a Zhang-Rice triplet state to a Zhang-Rice singlet state. Further narrowing of the exciton linewidths with decreasing temperature points to coherent collective processes assisted by the underlying zigzag or helical antiferromagnetic orders.