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Nanoscale positioning of single-photon emitters in atomically thin WSe_2

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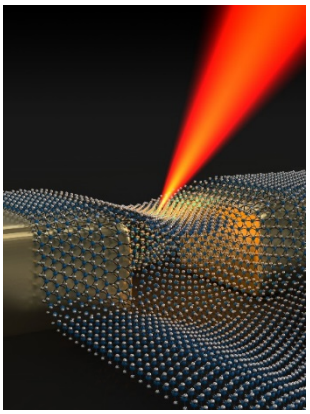

Single-photon sources are important building blocks for quantum technology. Solid-state single-photon sources such as semi-conductor quantum dots or color centers in diamond are of special interest, since they can be monolithically integrated into photonic waveguides and cavities. Recently, atomically thin transition metal dichalcogenides (TMDCs) have gained considerable attention as a new material class for optical and opto-electronic devices. Bright and stable single-photon emitters have been found in the atomically thin semiconductor WSe_2. However, so far, the localized light sources occur at random positions at the edges of the material [1].
We intentionally create single-photon emitters in monolayer WSe_2 at the nanoscale gap between two single-crystalline gold nanorods [2]. The specific strain landscape induced in the atomically thin semiconductor leads to the formation of a potential well, where single-photon emitters are localized with a precision better than 140 nm. Due to the elongation of the well either along or across the rod axis, the polarization of the emission is found to be oriented in the respective two directions.

References

1. P. Tonndorf et al., „Single-photon emission from localized excitons in an atomically thin semiconductor", Optica 2, 347 (2015).
2. J. Kern et al., "Nanoscale positioning of single-photon emitters in atomically thin WSe_2," Advanced Materials, accepted for publication (2016).