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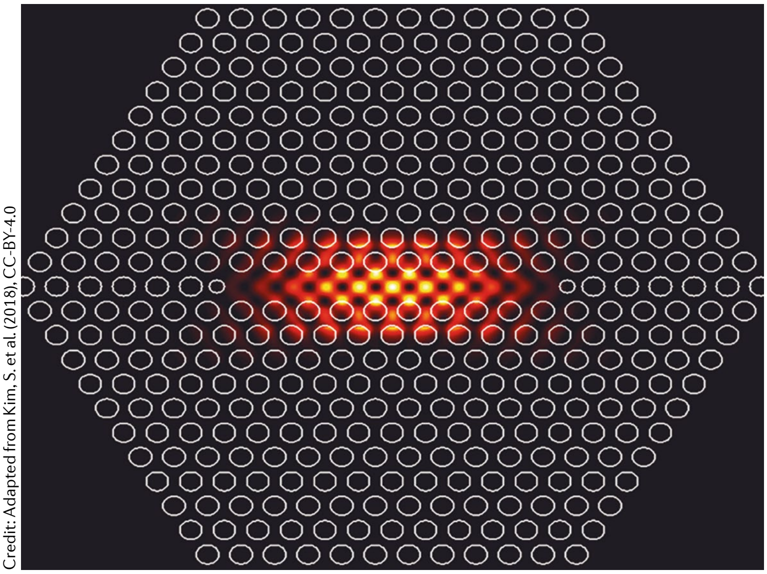

PHOTONICS

Guiding light at the nanoscale

Optoelectronic devices harness light-matter interactions to convert optical into electrical signals and vice versa. They are an essential part of widespread technologies such as light-emitting devices and optical communication systems. Essential to many optoelectronic devices are photonic crystal cavities, which can be thought of as optical waveguides that steer and manipulate light propagation. Although reaching the ultimate size limit for these devices would make it possible to integrate high-density photonic components on optoelectronic chips, squeezing light into extremely confined volumes faces intrinsic physical limitations. Writing in *Nature Nanotechnology*, Xingwang Zhang and co-workers report patterning a photonic crystal structure into an atomically thin WS_2 sheet, approaching the ultimate thickness limit that an optical waveguide can reach.

The photonic crystal devised by Zhang et al. consists of periodic square arrays of air holes etched into free-standing WS_2 layers that have thickness ranging from 2.4 nm (that is, four layers) to 0.6 nm (that is, a monolayer). In this ultrathin structure, a highly confined waveguide mode develops, propagates in-plane along the membrane and quickly decays away like an evanescent wave, thus enabling guiding of visible light at the angstrom thickness limit. This thickness is in the extreme deep subwavelength confinement regime whereby the ratio between the wavelength of light and the waveguide thickness can be as large as 1,000 for photons in the visible spectrum.

This work complements a previous approach developed by Sejeong Kim and co-workers. Writing in *Nature Communications*, they demonstrated a free-standing photonic crystal cavity from patterned ultrathin hexagonal boron nitride (hBN), a van der Waals layered material that features strongly confined light–matter interactions in the deep subwavelength regime. Both WS_2 and hBN naturally host quantum emitters — single-photon sources that are at the core of quantum photonics applications. Thus the photonic crystal cavities can be engineered to have integrated quantum emitters in the materials they are fabricated from, and may therefore lead to devices that combine on-chip quantum photonics functionalities with the benefits of strong light confinement.

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ORIGINAL ARTICLE Zhang, X. et al. Guiding of visible photons at the ångström thickness limit. *Nat. Nanotechnol.* https://doi.org/10.1038/s41565-019-0519-6 (2019)
RELATED ARTICLE Kim, S. et al. Photonic crystal cavities from hexagonal boron nitride. *Nat. Commun.* **9**, 2623 (2018)