

## High-efficient excitation of phonon polaritons in hexagonal boron nitride by silver nanowires

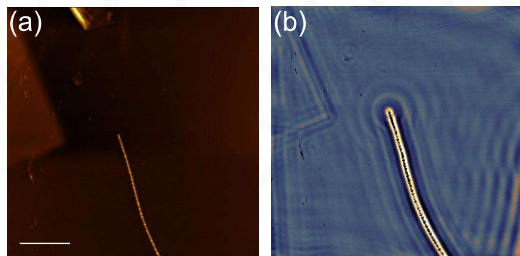
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### Summary

We spin-coated silver nanowires onto hexagonal boron nitride (hBN) flakes and carried out scanning near-field optical microscopy (SNOM) on the samples. We observed high-efficient excitation of phonon polaritons in hBN by silver nanowires. At the same time, we observed phonon polaritons excited by AFM tip reflected back upon reaching silver nanowires.

### Phonon polaritons excited by Ag nanowire

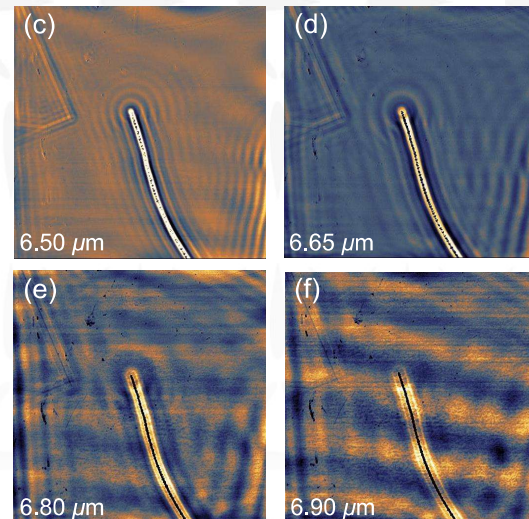
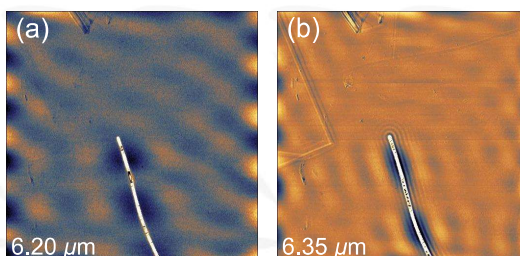
#### Basic characterizations



**Figure 1 | Phonon polaritons launched by silver nanowires on hBN.** (a) An AFM topographical image of a silver nanowire on hBN. (b) Near-field infrared nanoscopy image of Ag nanowire/hBN at excitation wavelength of  $6.65 \mu\text{m}$ , which shows fringes from Ag nanowire-launched and tip-launched phonon polaritons.

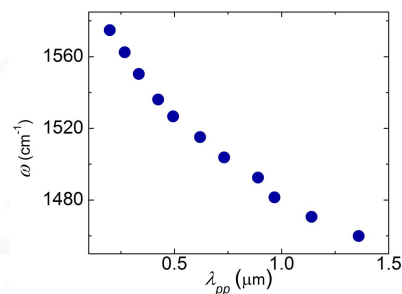
We spin-coated diluted solution of silver nanowires onto hBN flakes. Figure 1a is an AFM topographical image of a typical sample. The height of the Ag nanowire is 50 nm. Scale bar equals  $3 \mu\text{m}$ . Figure 1b is the corresponding SNOM image measured at excitation wavelength of  $6.65 \mu\text{m}$ . We observed fringes from Ag nanowire-launched and tip-launched phonon polaritons. The intensity of tip-launched phonon polaritons is weaker than Ag nanowire-launched phonon polaritons.

#### Phonon polaritons at different excitation wavelengths



**Figure 2 | Phonon polaritons at different excitation wavelengths.** (a-f) Near-field infrared nanoscopy images of Ag nanowire/hBN at excitation wavelength from  $6.2$  to  $6.9 \mu\text{m}$ .

Figure 2 presents phonon polaritons excited by Ag nanowires at different excitation wavelengths. Out of hyperbolic frequency range of hBN, we just observed the plasmon polaritons on Ag nanowires, as shown in Figure 2a. In the phonon resonance range of hBN, the dispersion relation of phonon polaritons of hBN is hyperbolic, as showed in Figure 3.



**Figure 3 | The dispersion relation of phonon polaritons in hBN.**

### References

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2. Joshi, T. *et al.* Coupled One-Dimensional Plasmons and Two-Dimensional Phonon Polaritons in Hybrid Silver Nanowire/Silicon Carbide Structures. *Nano Lett.* **17**, 3662 (2017).

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