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Supplementary information

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Surface-patterned chalcogenide glasses with high-aspect-ratio microstructures for long-wave infrared metalenses

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Section 1: Details of the multilayer antireflection coating

In order to reduce the reflection loss of the all-chalcogenide metalens, we deposited a multilayer antireflection (AR) coating on the backside the as-fabricated metalens, which demonstrate a broadband antireflection behavior in the LWIR range. The layer composition and thickness parameters are summarized in Fig. S1(a). Figure S1(b) shows the transmission spectra within 8 μm to 12 μm for a bare As_2Se_3 disk and a single-side AR coated As_2Se_3 disk, measured by a FTIR spectrometer. This AR coating could improve the transmittance from 63.2% to 77.8% at 9.78 um, as shown in Fig. S1, approaching the theoretical value of a single As_2Se_3-Air interface transmittance. With the help of AR coating, we could achieve a focusing efficiency of 47% at the wavelength of 9.78 μm.

a

Layer No.	Material	Thickness (nm)
1	Ge	368.20
2	ZnS	386.50
3	Ge	339.71
4	ZnS	1040.74
5	YbF_3	1038.50
6	ZnS	185.13

b

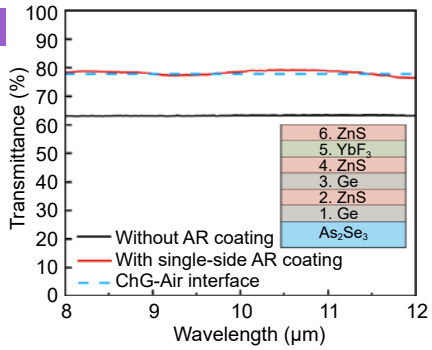

Fig. S1 | (**a**) Materials and thickness parameters of the multilayer anti-reflection coating. (**b**) Transmission spectra of As_2Se_3 glass with and without single-side of multilayer AR coating, inset shows the structure of the multilayer AR coating.