ADVANCED OPTICAL MATERIALS

Supporting Information

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Pancharatnam–Berry Phase Manipulating Metasurface for Visible Color Hologram Based on Low Loss Silver Thin Film

Sajid Choudhury, Urcan Guler, Amr Shaltout, Vladimir M. Shalaev, Alexander V. Kildishev, and Alexandra Boltasseva**

Supporting Information

XRD Measurement of the Silver Film

To analyze the grain size of the silver micro-crystals of the thin film, XRD measurement was performed on the silver thin film. Figure S1 shows the XRD measurement data and the inset shoes the FWHM of the XRD peak. The grain sizes are determined using the Scherrer equation,

$$\tau = \frac{K\lambda}{\beta \cos\theta}$$

where we use shape factor, K = 0.9, x-ray wavelength, λ = 1.54059 Å, Full width Half Maximum of the peak, β= 0.2249°, Bragg angle, θ = 44.5836°. The grain sizes for a 50-nm silver film were found to be around τ = 496 Å.

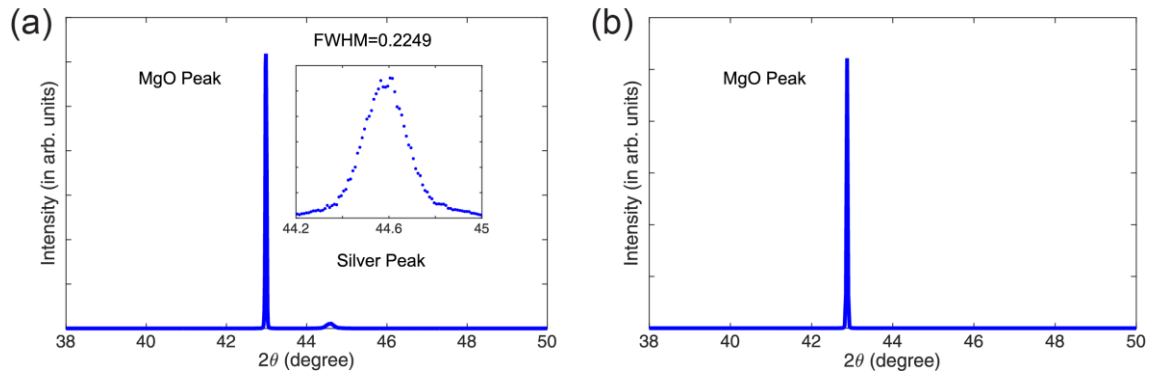

Figure S1 (a) XRD counts of Epitaxial Silver film on MgO substrate. Inset shows the magnified silver peak.(b) XRD counts of polycrystalline silver film.

To compare the XRD results with polycrystalline silver films, we prepared a sample with e-beam evaporated Silver and Germanium. Germanium wetting layer and polycrystalline silver film was deposited using e-beam evaporation onto an MgO substrate. XRD data shows no visible peak for the thin film.

TEM Measurement of the Silver Film

To further demonstrate the crystallinity of the silver film, the sample of silver thin film with Germanium wetting layer and 50-nm silver film with 4-nm TiN layer were both characterized using a Transmission Electron Microscope. Both the Silver and TiN layers are epitaxial. Figures S2 (a) and (b) show the TEM images of the sputtered silver film with TiN layer. Figures S2 (c) and (d) show TEM images of the silver film with Germanium layer.

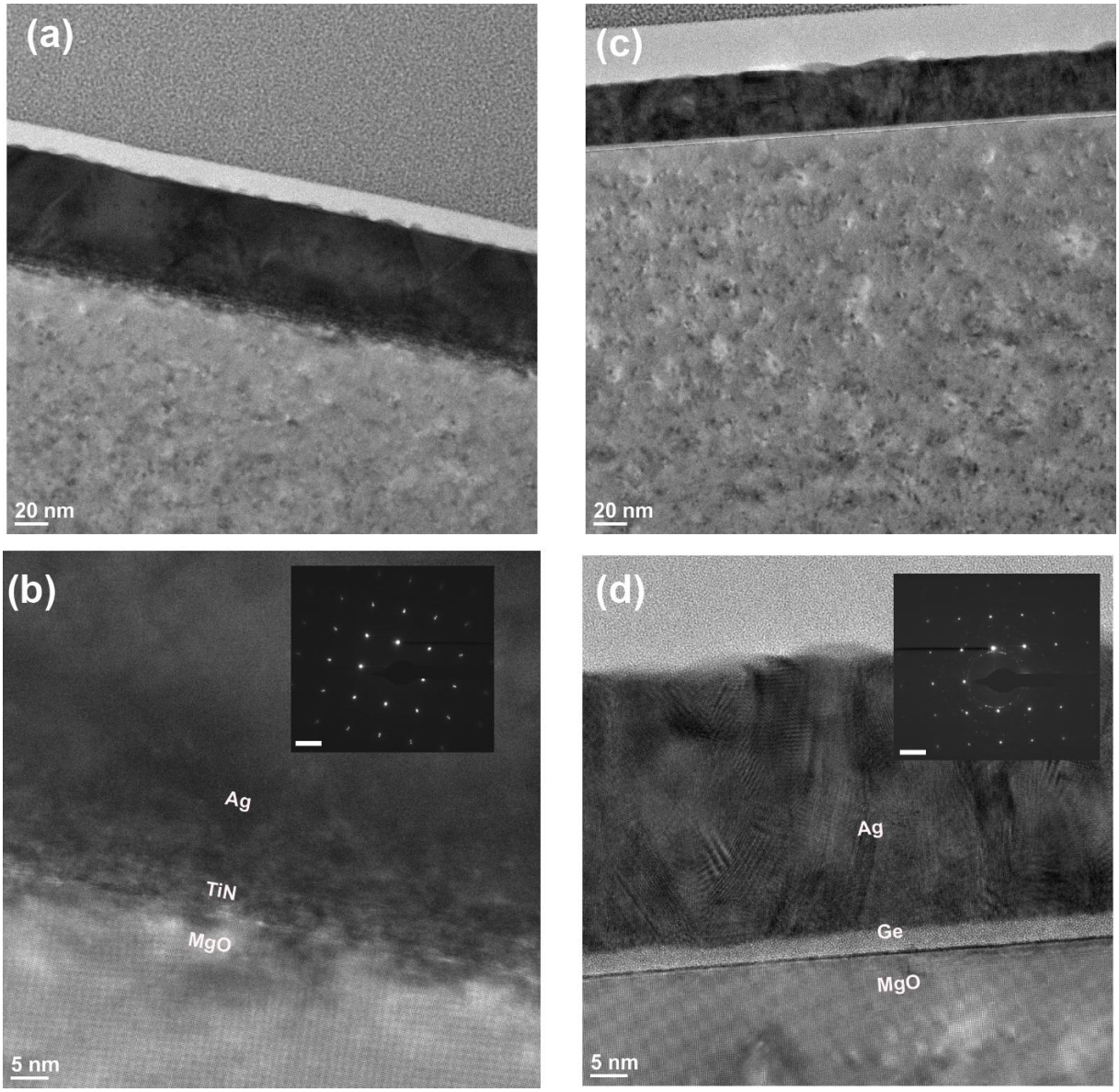

Figure S2 TEM image of (a)-(b) silver film with TiN wetting layer and (c)-(d) silver film with Germanium layer. Inset of (b) and (d) shows FFT