SUPPLEMENTARY INFORMATION

Structural Color Filters Enabled by a Dielectric Metasurface Incorporating Hydrogenated Amorphous Silicon Nanodisks

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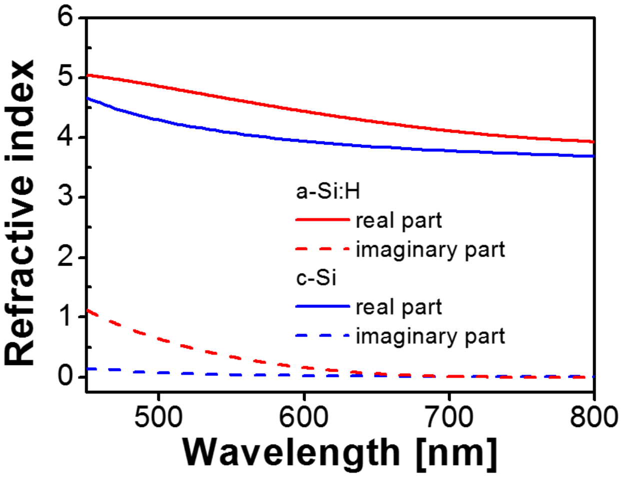
1. Material properties used for the calculation.

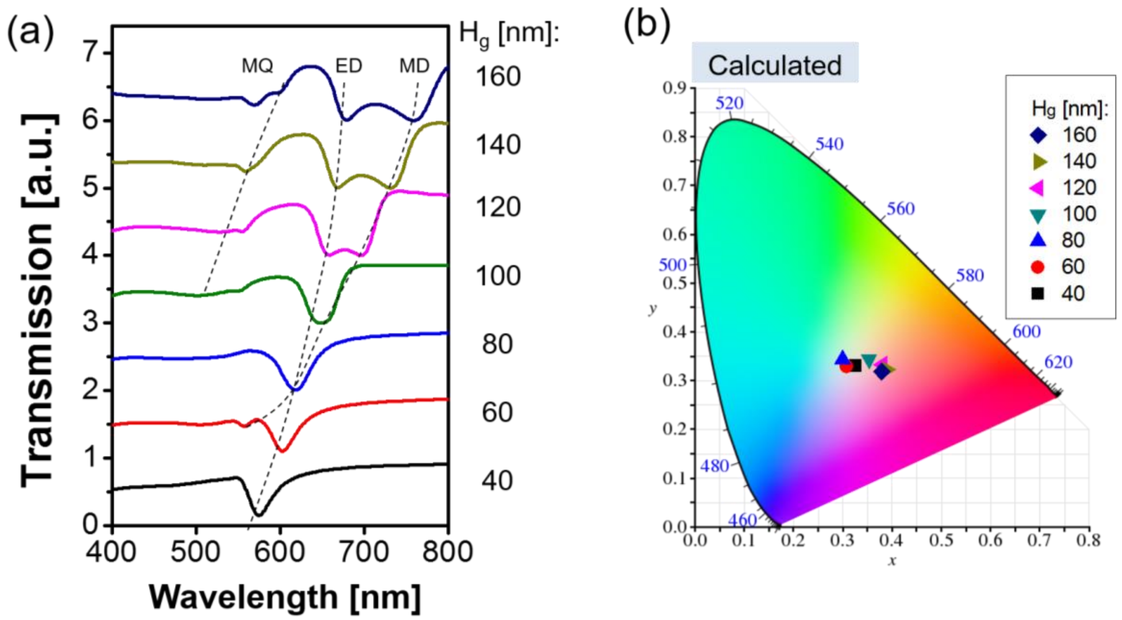
Figure S1 shows the refractive indices of a-Si:H and c-Si. The former was obtained by characterizing a film that is deposited on a glass substrate with the help of a reflecto-spectrometer, while the latter is available from Palik [1].



Supplementary Figure S1. Refractive indices of a-Si:H and c-Si that are used for the calculation.

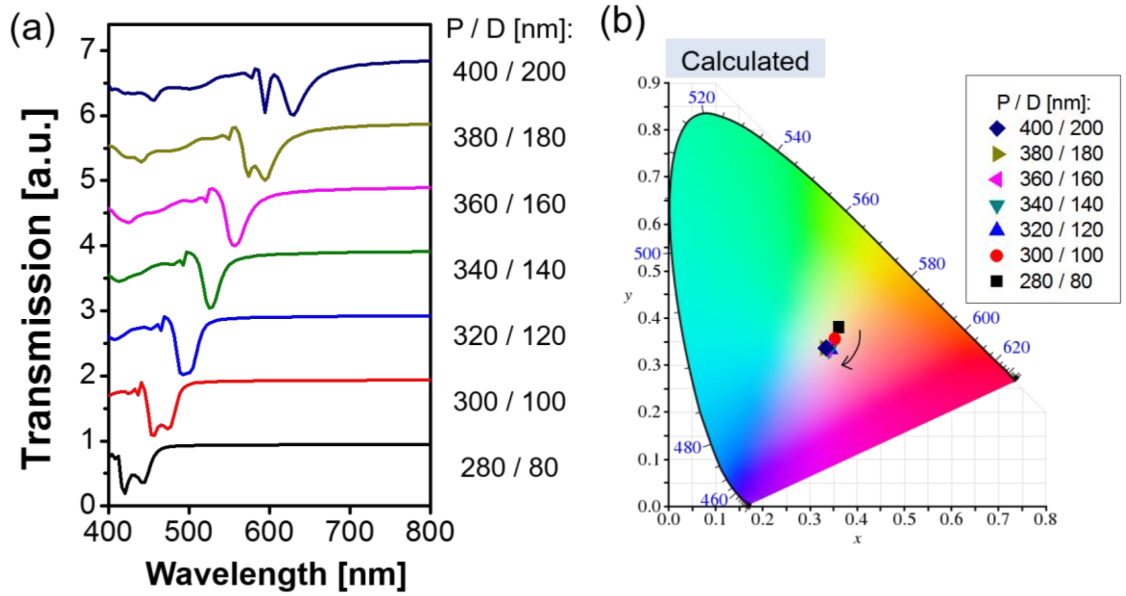
2. Effect of the height (H_g) of a-Si:H nanodisks on the device performance.

The location of the transmission dips pertaining to the electric dipole (ED) and the magnetic dipole (MD) can be altered by changing the height (H_g). As H_g is increased, both the ED and MD resonance dips tend to be red-shifted, with the MD resonance occurring in the longer wavelength region than the ED resonance. For H_g beyond 100 nm, it is particularly noted that small transmission dips, which are accounted for by a multi-pole resonance such as a magnetic quadrupole (MQ), are observed to manifest in the spectral band shorter than the ED and MD resonances [2, 3], as indicated in Figure S2.



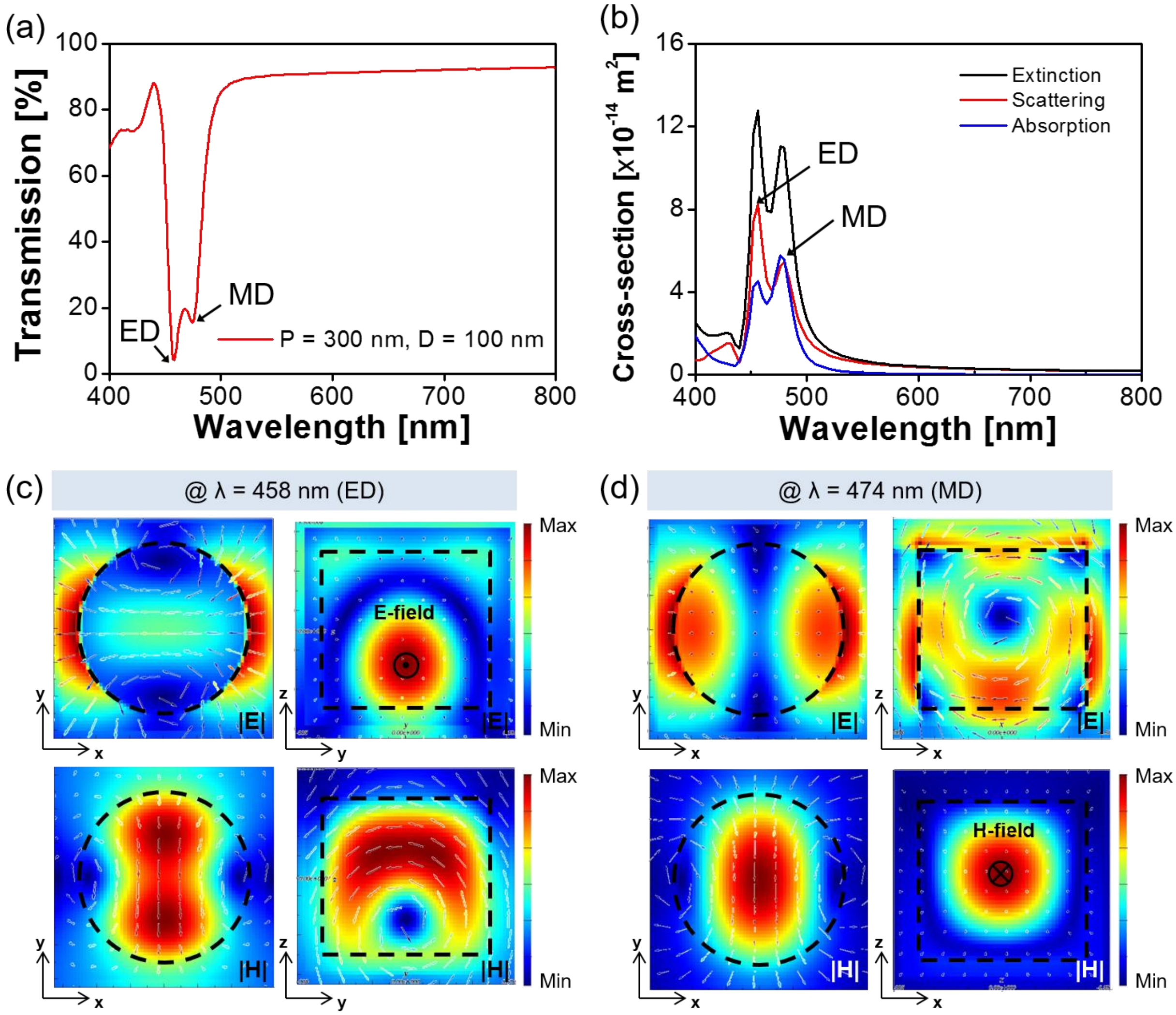
Supplementary Figure S2. (a) Calculated transmission spectra for the metasurface with P = 380 nm and D = 180 nm, while H_g is varied from 40 nm to 160 nm. (b) CIE 1931 chromaticity diagram for the corresponding color output.

3. Performance of the metasurface based on a c-Si nanodisk.



Supplementary Figure S3. (a) Calculated transmission spectra for the metasurface exploiting a c-Si nanodisk when the period is varied from P = 280 nm to 400 nm under the relationship of P = D + 200 [nm], while the diameter is varied from D = 80 nm to 200 nm. (b) CIE 1931 chromaticity diagram for the corresponding color output.

4. Observation of the Mie scattering-induced resonance for the metasurface that engages a c-Si nanodisk.



Supplementary Figure S4. (a) Calculated transmission spectra for the metasurface with P = 300 nm and D = 100 nm, rendering two distinct resonances at λ = 458 nm and 474 nm. (b) Calculated extinction, scattering, and absorption cross-section for the c-Si nanodisk. Field profiles for (c) the ED resonance at λ = 458 nm and (d) the MD resonance at λ = 474 nm.

References

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