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Supplementary Materials: Double-Sided Anti-Reflection Nanostructures on Optical Convex Lenses for Imaging Applications

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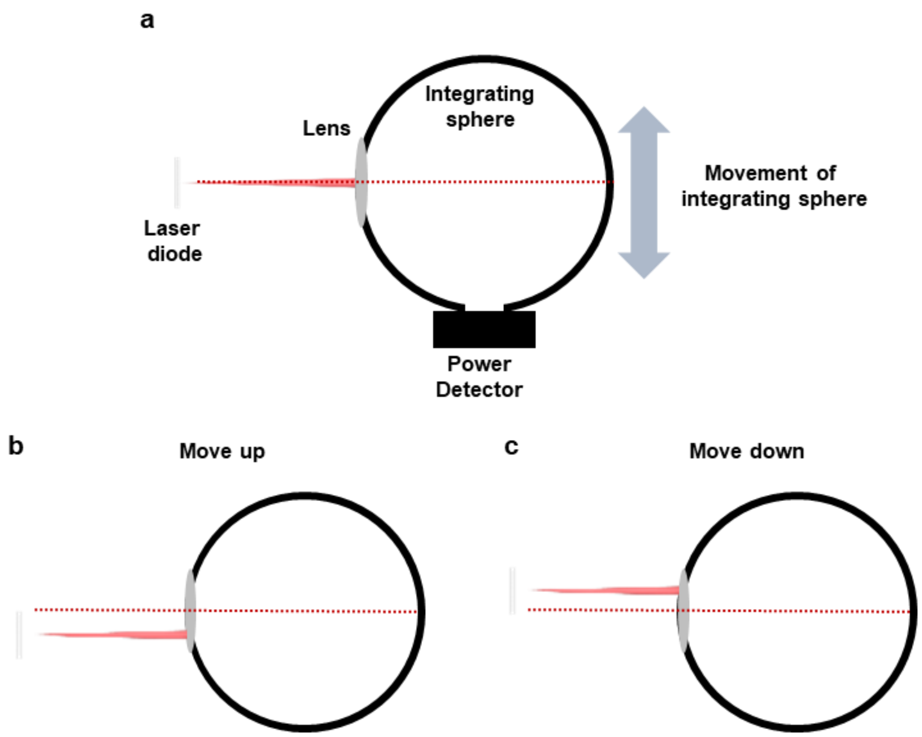

Figure S1. (**a**) Schematic of measurement setup for optical power enhancement with different positions of double-sided ARCs on bi-convex BK7 lens. The operating wavelengths are 520, 635, and 980 nm. All laser diodes are equipped with collimated lens. (**b**,**c**) Schematics for "move up" and "move down" situations of the integrating sphere.

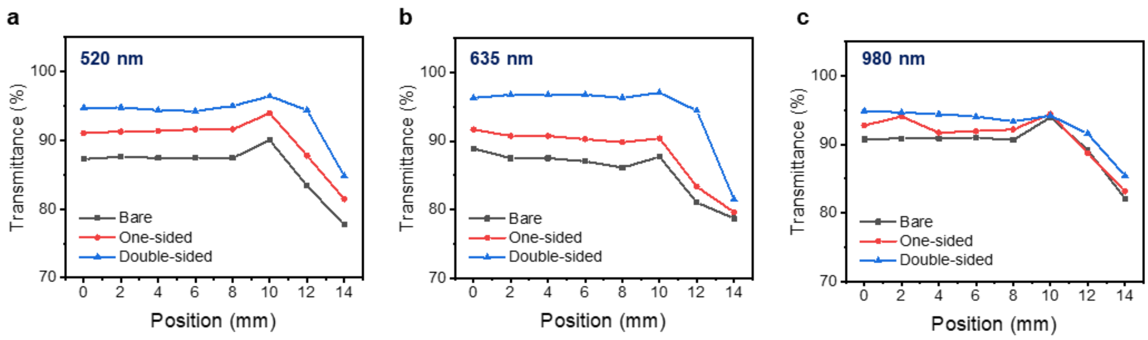

Figure S2. Measured transmittances of bare, one-sided, and double-sided ARCs on BK7 bi-convex lenses for three wavelengths of (**a**) 520 nm, (**b**) 635 nm, and (**c**) 980 nm, depending on positions. The transmittance was derived by dividing the optical powers measured without and with lens.

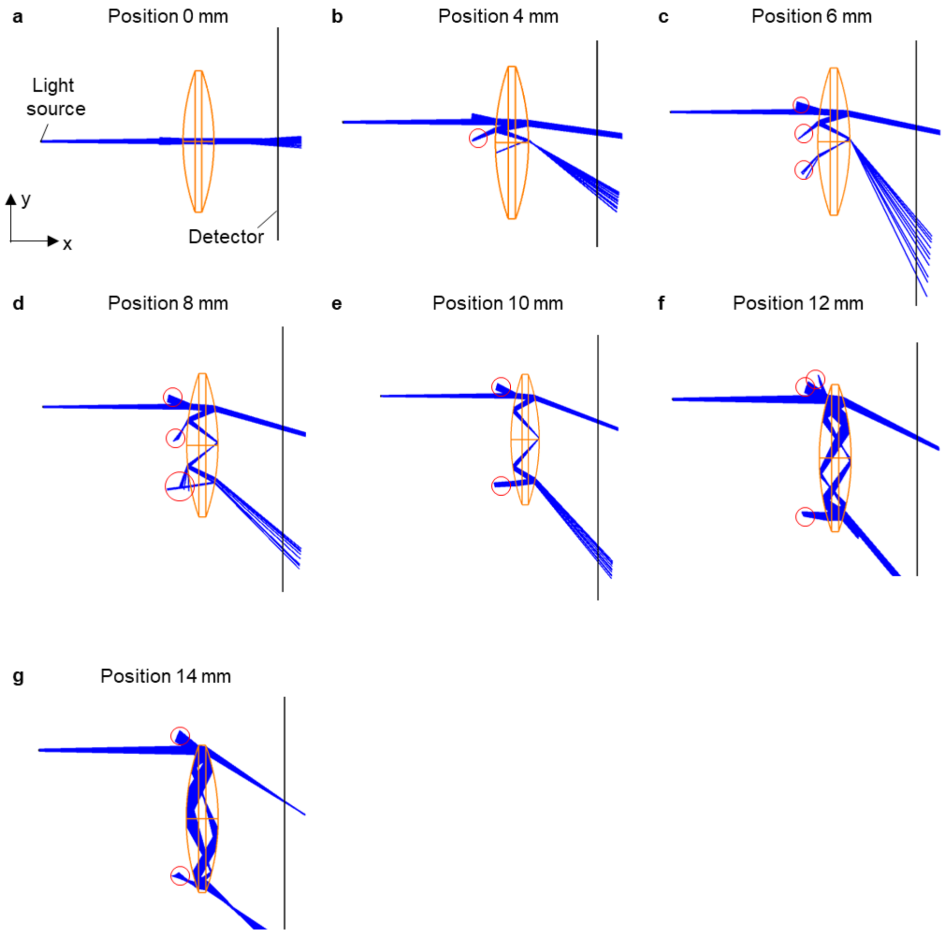

Figure S3. Ray-tracing simulation on bare BK7 bi-convex lens with different positions (**a**–**g**) from 0 to 14 mm with 2-mm-step. The position means that the deviation of light source from the center of the lens in y-direction. Red circles indicate that the back reflected lights undergoing multiple total internal reflections (TIRs). These TIRs degrade the light transmittance at peripheral side of lens. The simulated wavelength is 550 nm. A commercial software based on Monte-Carlo method (OpticStudio 16.0, ZEMAX, Washington, USA) is used for ray-tracing simulation.

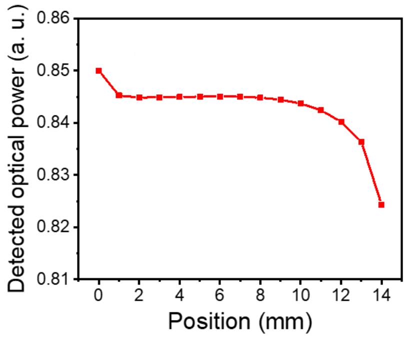

Figure S4. Detected optical power as a function of position shown in Figure S3. From 0 to 10 mm, the optical power tends to maintain at 0.845, whereas the optical power decreases over 10 mm.

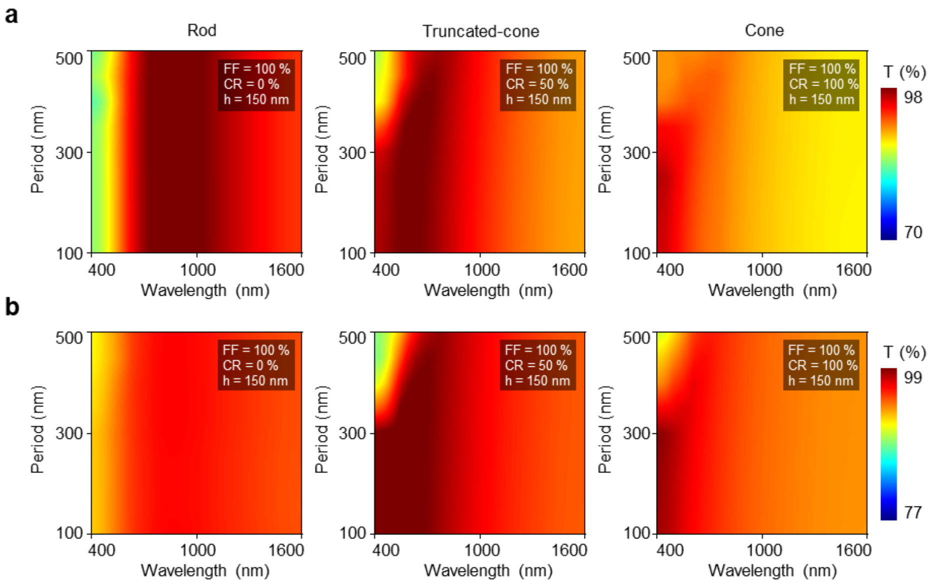

Figure S5. Contour plots of calculated transmittance spectra as a function of period for glass materials of (**a**) SF11 and (**b**) BK7.

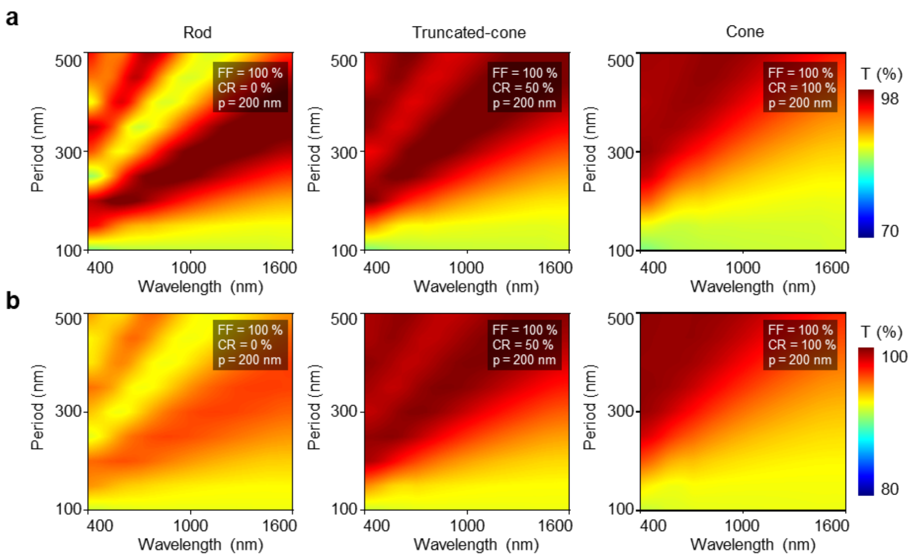

Figure S6. Contour plots of calculated transmittance spectra as a function of height for glass materials of (**a**) SF11 and (**b**) BK7.

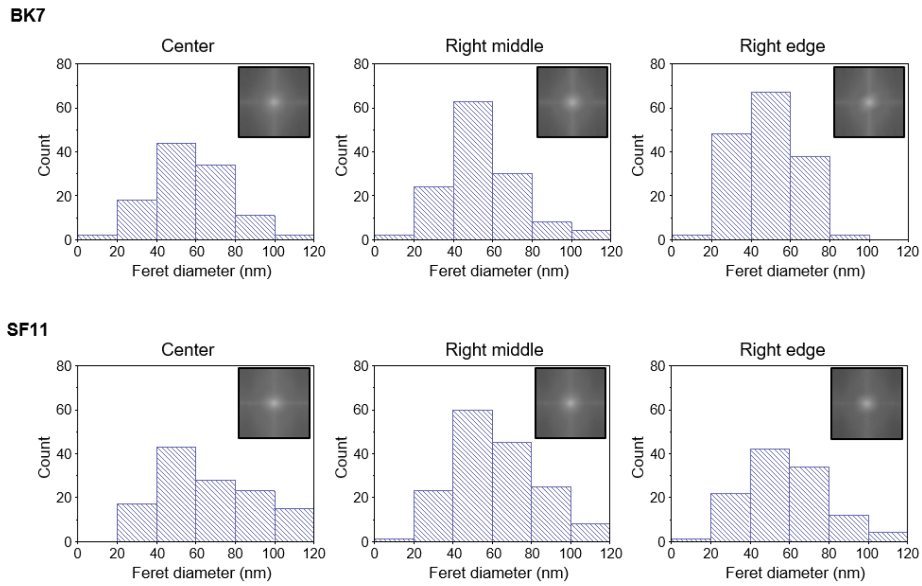

Figure S7. Bar plot of the island size distribution depending on the positions and lens materials.