Plasmonic Nanohole Arrays Actuated by a Thermoresponsive Hydrogel Cushion

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Supporting Information

pNIPAAm layer was prepared on a flat, non-porous 50 nm Au layer on top of a glass substrate by using identical protocol as on the Au NHA structure. Attenuated total reflection method with Kretschmann geometry was used to probe the polymer film by resonantly excited surface plasmons and dielectric waveguide modes. The excitation of these modes manifests itself as series of reflectivity dips as seen **Figure S1**. As described in our previous studies,[35] the analysis of observed resonances allowed us independently determining the thickness and refractive index of the pNIPAAm-based film. The thickness of dry pNIPAAm polymer film was measured to equal 212 nm and the refractive index was 1.48. When the film

was brought in contact with water at a temperature of T = 22 °C, it swelled and its thickness increased to 1.2 µm, which corresponds to a swelling ratio of SR = 5.5. The refractive index of swollen pNIPAAm layer was determined as 1.36. When increasing the temperature to T = 40 °C, the film collapsed and its refractive index increased to 1.46 and thickness decreased to about 210 nm.

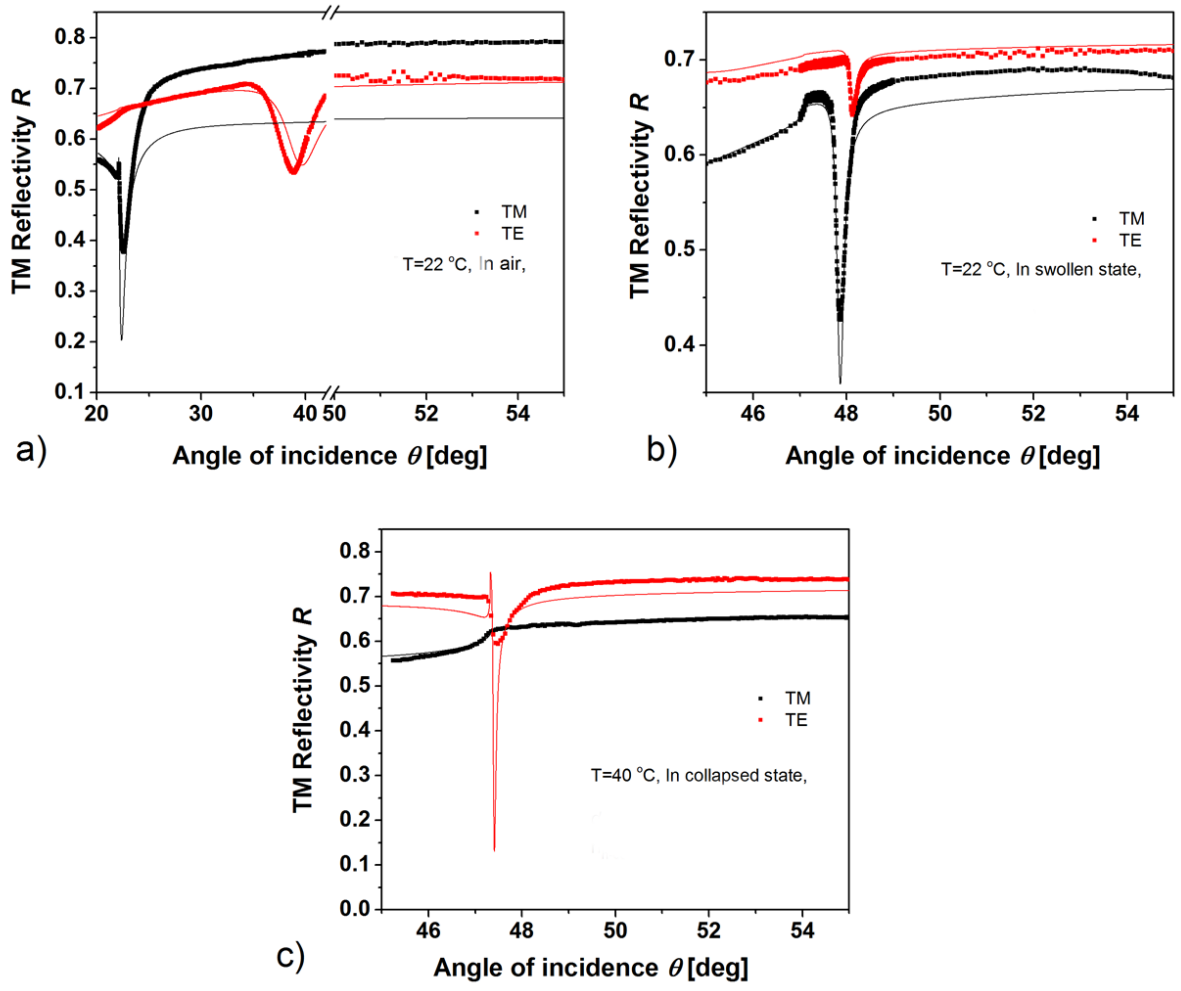

Figure S1 Angular reflectivity spectra measured in transversally magnetic (TM) and transversally electric (TE) polarization for a pNIPAAm hydrogel film in contact with a) air at T = 22 °C, b) swollen in water at T = 22 °C and c) collapsed at T = 40 °C in water. The spectra were fitted with transfer matrix-based model as indicated by lines.

Figure S2 shows the dependence of resonant wavelengths λ_o and λ_i on the refractive index changes at the inner (n_i) and outer (n_o) surface of Au NHA. These values were determined from shifts of respective dips in measured transmission spectra (showed in **Figure 3**) as a minimum of fitted analytical function (Gaussian dip).

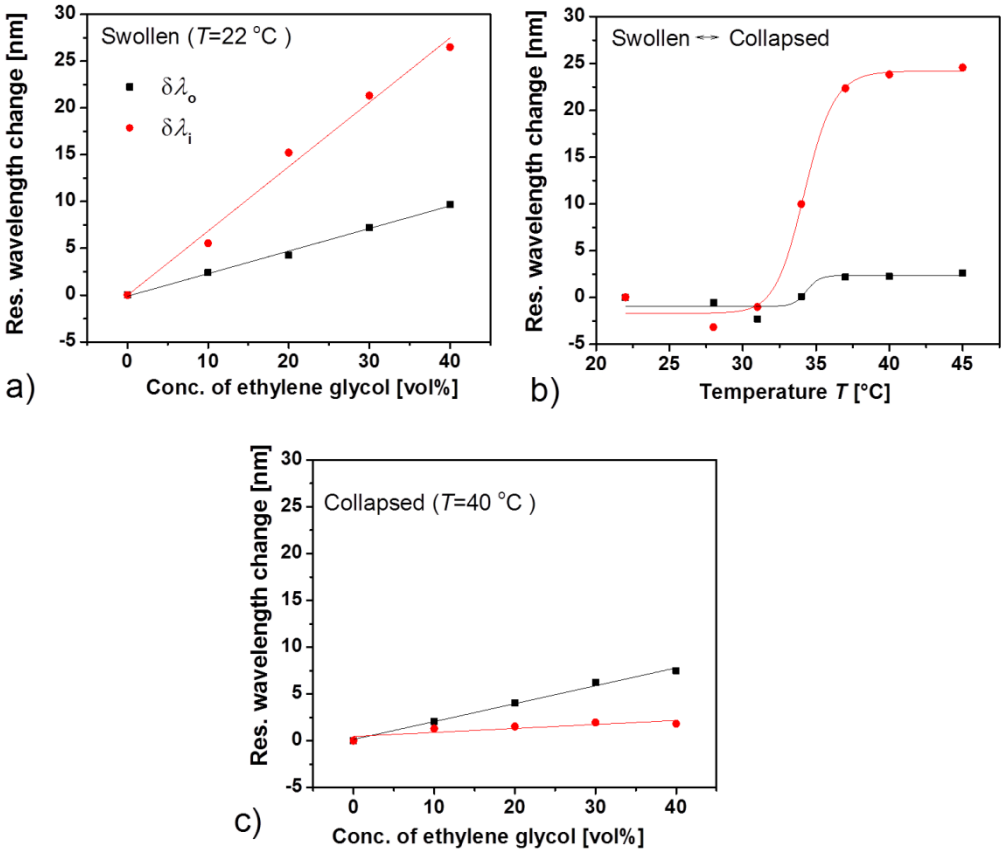

Figure S2 Measured changes in the resonant wavelength λ_o and λ_i associated to the coupling to SPP_o and SPP_i modes. Wavelength changes measured for a) swollen hydrogel cushion at T = 22 °C and c) collapsed cushion at T = 40 °C when concentration of ethylene glycol in aqueous samples was varied (data fitted with a linear function). b) Data measured in water (n_o = 1.33) and upon increasing a refractive index of inner dielectric (n_i) by temperature-induced collapse of pNIPAAm cushion (data fitted with sigmoidal function).