Electronic Supplementary Material (ESI) for Physical Chemistry Chemical Physics.

Supplementary Information

Suppression of plasmon-quenching effect on light amplification in 20-μm-diameter plasmonic whispering gallery mode resonators fabricated from bowl-shaped organic/metal thin films

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Scanning electron microscope (SEM) images of 100-nm-thick metal films on the microspheres

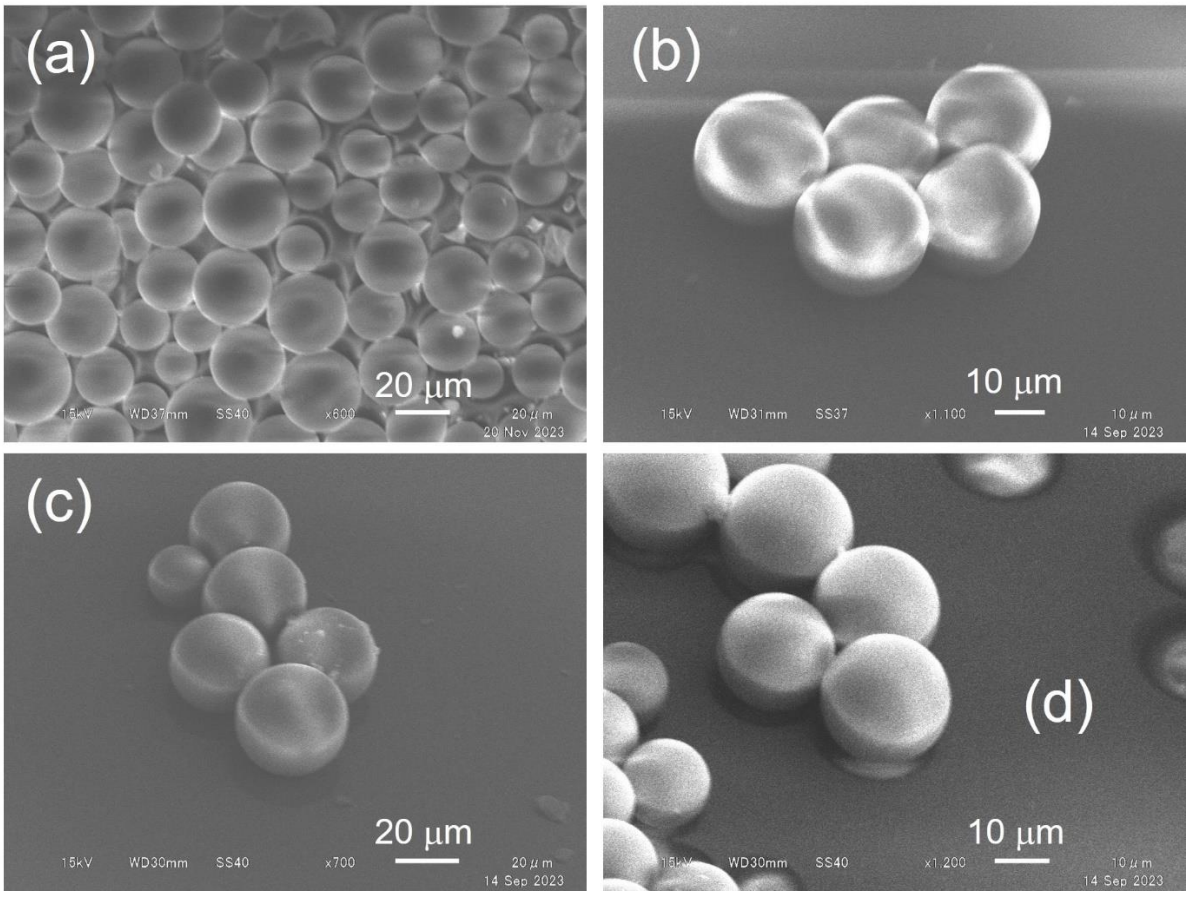

Figure s1. SEM images of the microspheres (a) w/o metal film, (b) w/ Al, (c) w/ Ag, and (d) w/ Au. Thickness of all the metal films was 100 nm.

Optical characteristics in the microresonators that included the vapor deposited Au layer

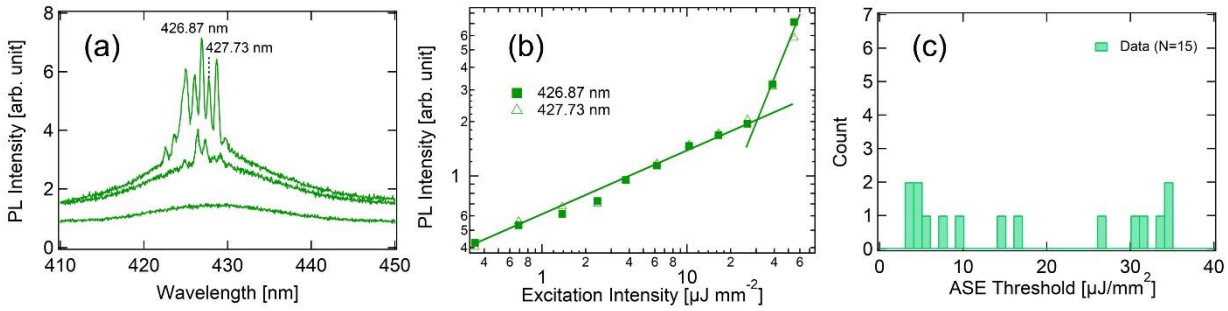

Figure s2. Optical characteristics of the resonators w/ Au. (a) Dependence of the PL spectra on the excitation intensity I_{ex} [(from bottom to top) I_{ex} = 10.3 , 38.9 , 54.7 μJ mm^{-2}]. The intervals between neighboring peaks were much smaller than the simulated interval in most cases, implying that mode coupling occurred. (b) L-L characteristics. (c) Histograms of I_{th}. ASE characteristics were obtained in only 35% of the resonators. Moreover, 93% of them showed mode coupling. We consider that the silica microspheres with Au layers were peeled off during the device fabrication process in the resonators exhibiting ASE, and that ASE in the resonators w/ Au is basically difficult to occur if the resonators were successfully fabricated.

Histograms of I_{th} in the microresonators

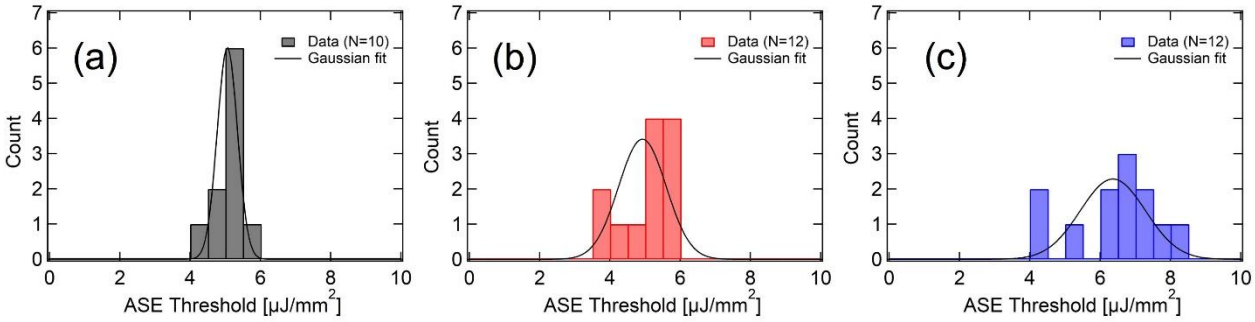

Figure s3. Histograms of I_{th} for the resonators (a) w/o metal, (b) w/ Al, and (c) w/ Ag. The black lines are fits by the Gaussian-type function. More than 85% of the resonators successfully showed ASE.

Simulation of electric fields in the microresonators with the 100-nm-thick metal layers

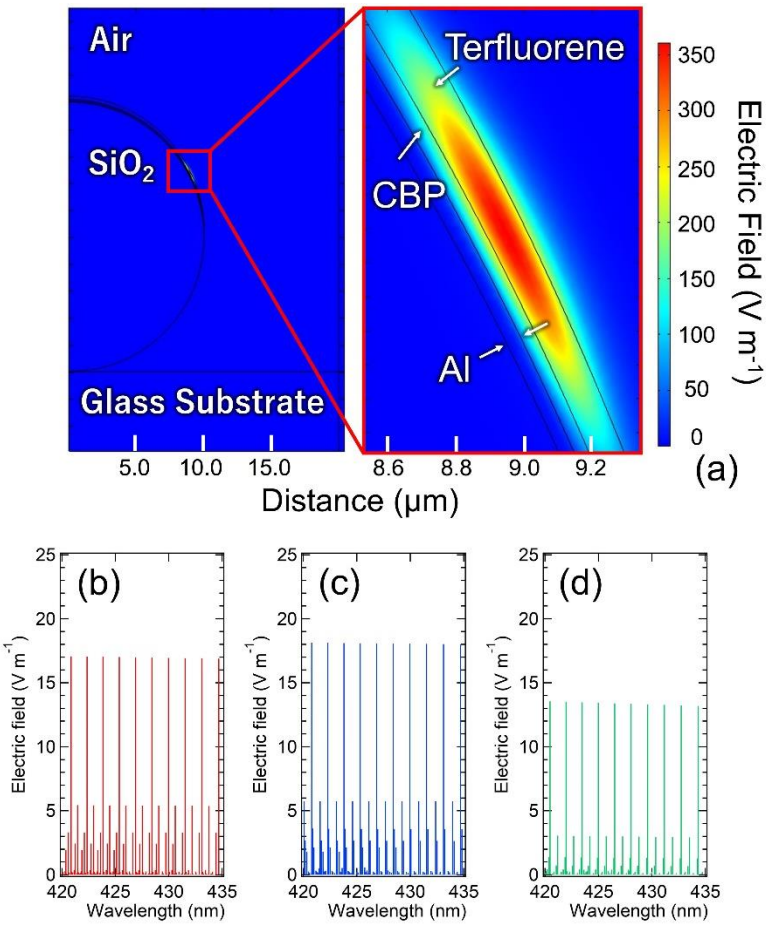

Figure s4. (a) Spatial distribution of the electric field in the resonator w/ Al [20-μm-diameter silica microsphere/Al (100 nm)/CBP (100 nm)/terfluorene (250 nm)]. Spectra of the electric fields (area-average values in each terfluorene) in the resonator structures (b) w/ Al (100 nm), (c) w/ Ag (100 nm), and (d) w/ Au (100 nm). The thickness of each layer was modelled as the product of the maximum thickness and sin θ, where θ is the angle between the normal of the substrate surface and the tangential line of the microsphere surface (T. Mikajiri et al., *Phys. Chem. Chem. Phys.*, 2024, **26**, 2277–2283).