Supplementary Information

Thermal chemical vapor deposition of layered carbon nitride films under hydrogen gas atmosphere

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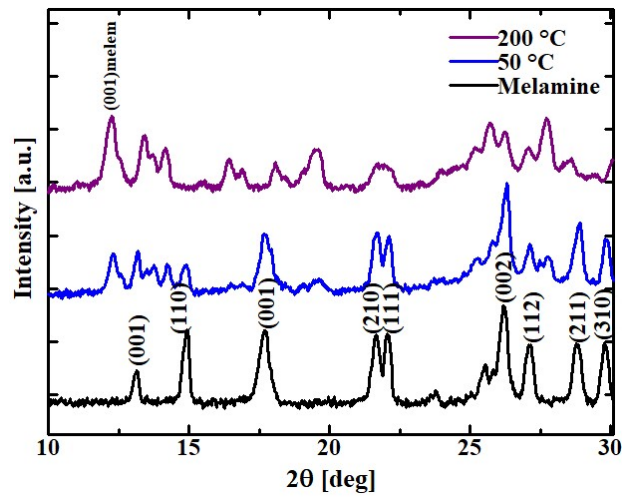 Tel: +81-26-269-5261; Fax: +81-26-269-5200

Figure S1. X-ray diffraction profiles for pristine melamine powder and heated melamine powder at 50 and 200 °C. Chemical vapor deposition in this study was conducted at a precursor temperature of 200 °C.
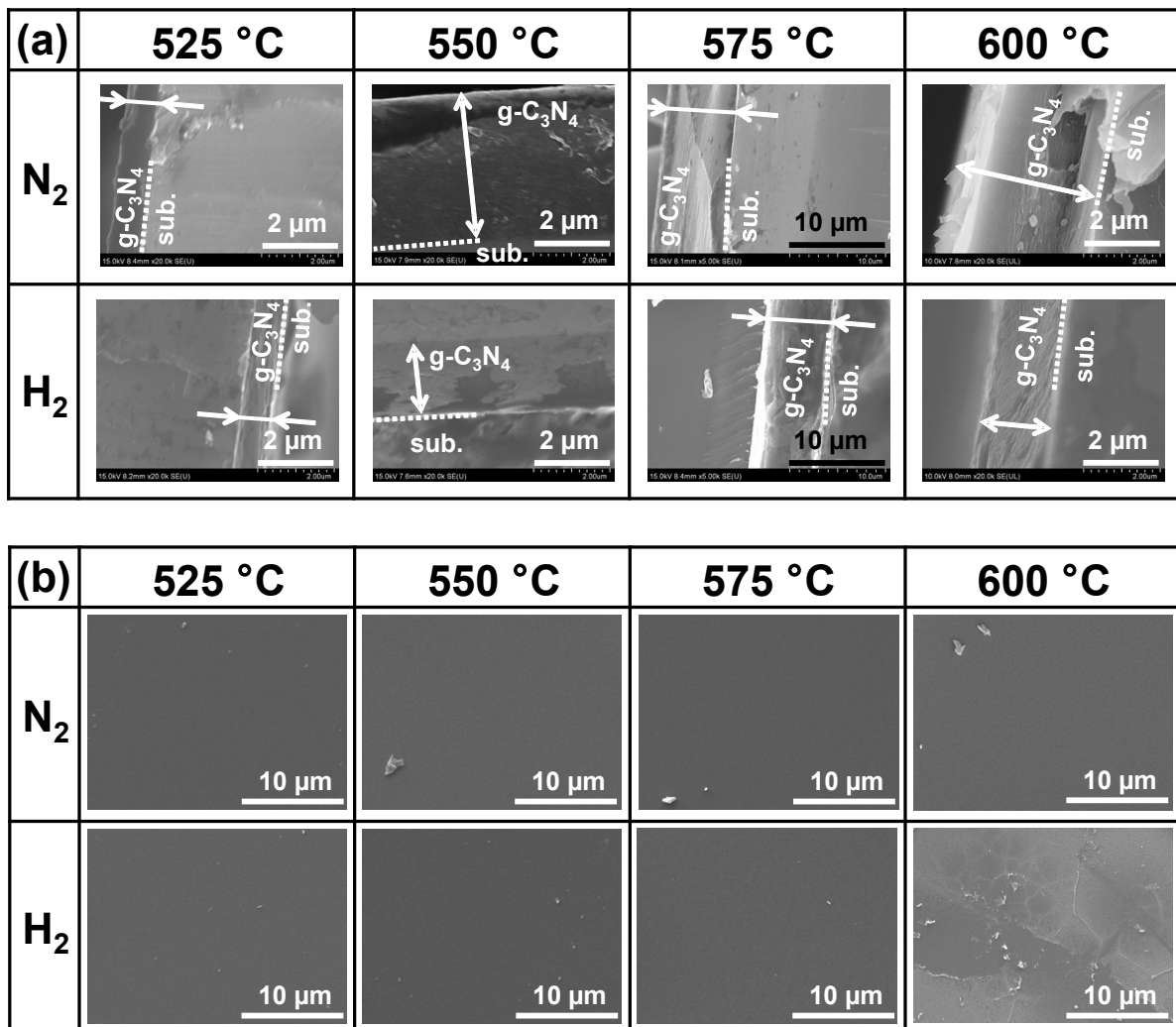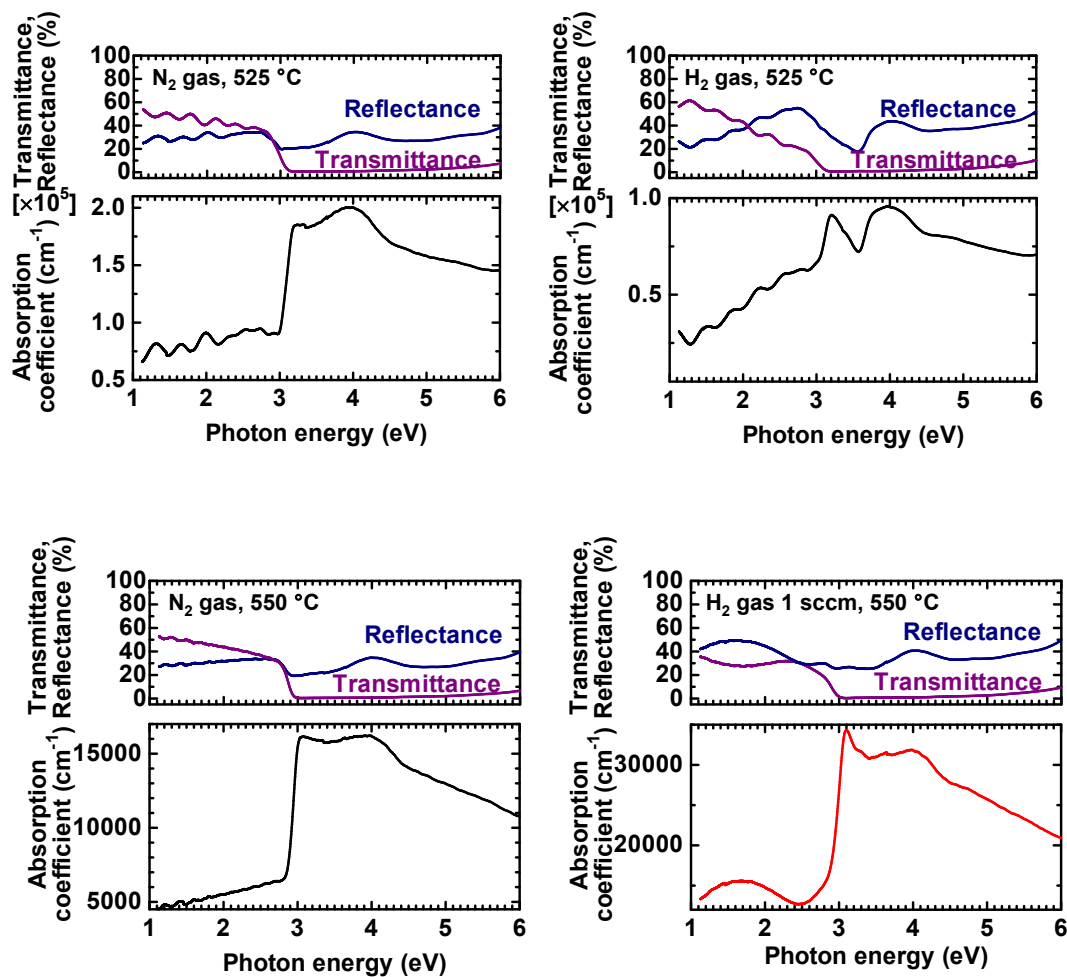
Figure S2. (a) Cross-sectional SEM images of g-C$_3$N$_4$ films deposited at various substrate temperatures under N$_2$ and H$_2$ gas flow. Scale bar is 2 μm for 525, 550 and 600 °C and is 10 μm for 575 °C. (b) Plan-view scanning electron microscopy (SEM) images of g-C$_3$N$_4$ films deposited at various substrate temperatures under N$_2$ and H$_2$ gas flow. Scale bar is 10 μm. The SEM equipment with cold-field emission (SU8000, Hitachi High-Tech Corp.) was used. To prevent charge-up during SEM observation, a few nm-thick platinum film was deposited on the film surface.
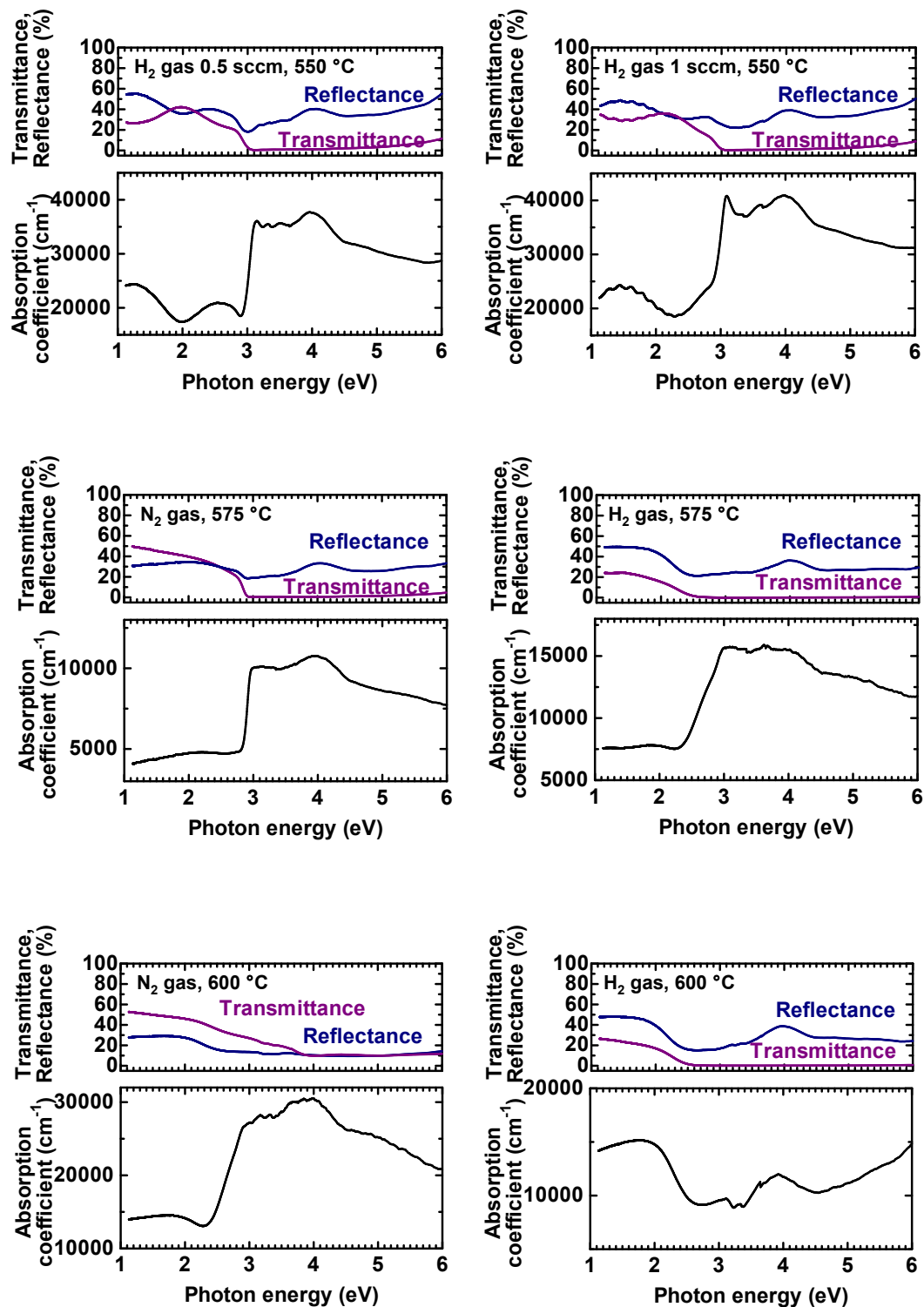
Figure S3. Optical absorption coefficient for g-C₃N₄ films estimated using transmittance and reflectance spectroscopy. (Upper) Transmittance and reflectance spectra and (lower) absorption coefficient depending on photon energy. (Left) Deposition under N_2 gas flow and (right) deposition under H_2 gas flow.
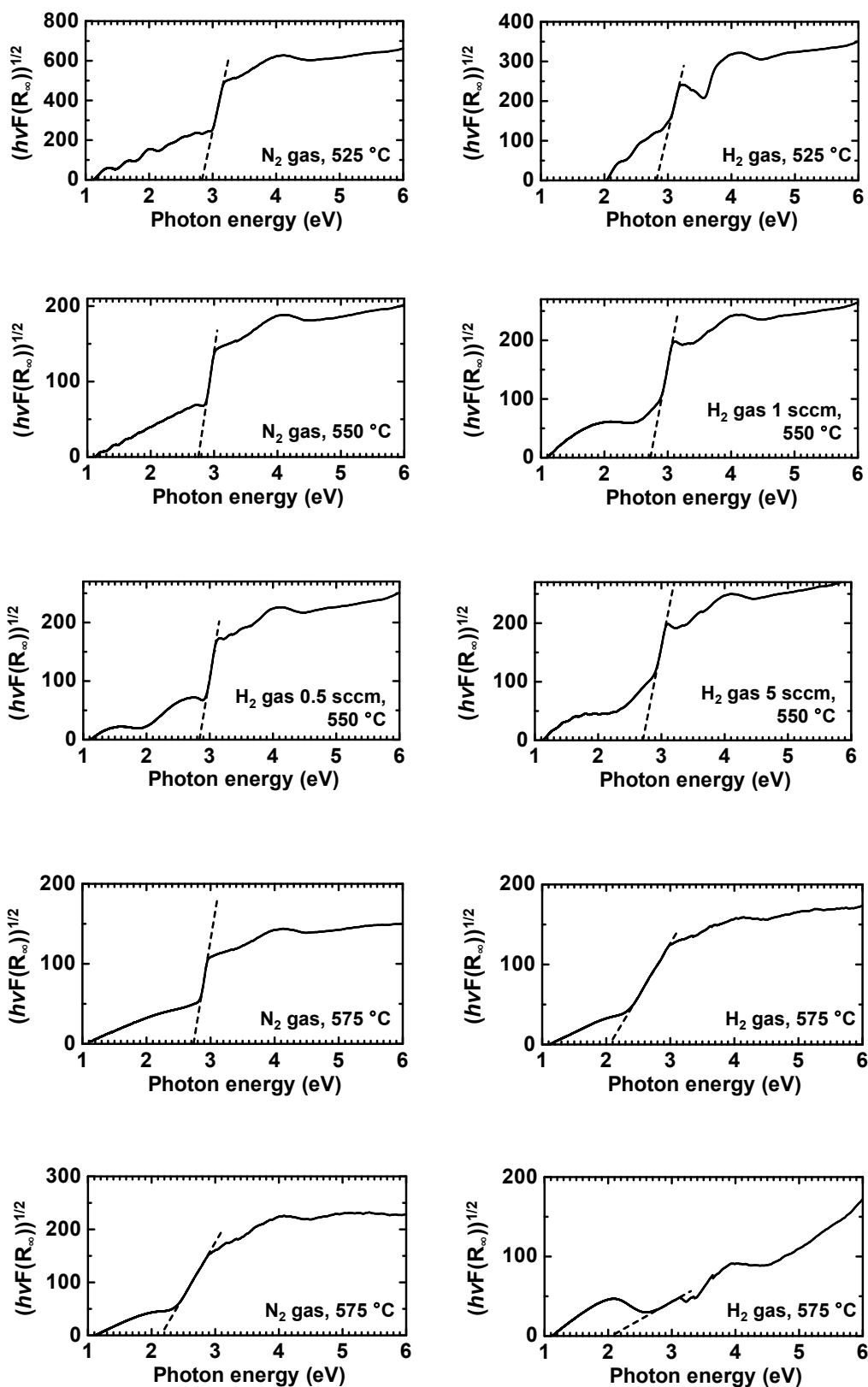
Figure S4. Kubelka-Munk plots of g-C$_3$N$_4$ films, which were fitted to obtain the absorption coefficient as a function of photon energy.
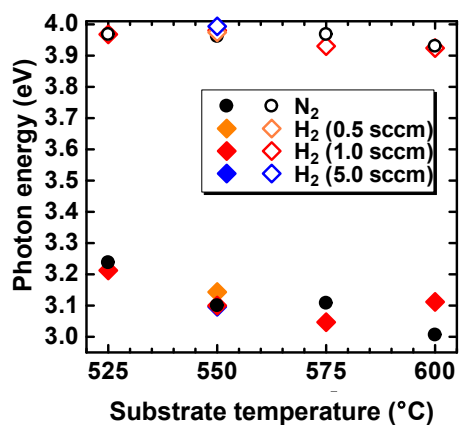
Figure S5. Absorption peaks at 3.0-3.1 eV and 4.0-4.1 eV originated from the transition between the conduction band and valence band for an sp^2 C-N π band (π*-π) and the transition between N nonbonding orbital and the aromatic nonbonding orbital (n-π*), respectively.