Supporting Information

Thermal Diffusivity of Hexagonal Boron Nitride Composites Based on Cross-Linked Liquid Crystalline Polyimides

Yu Shoji,[†] Tomoya Higashihara,[†,‡] Masatoshi Tokita,[†] Junko Morikawa,[†] Junji Watanabe,[†] and Mitsuru Ueda[†]*

[†] *Department of Organic and Polymeric Materials, Graduate School of Science and Engineering, Tokyo Institute of Technology, 2-12-1-H-120, O-okayama, Meguro-Ku, Tokyo 152-8550, Japan*

[‡] *PRESTO, Japan Science and Technology Agency (JST), 4-1-8, Honcho, Kawaguchi, Saitama 332-0012, Japan*

E-mail addresses: ueda.m.ad@m.titech.ac.jp

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Experimental data for non cross-linked **P1**. IR (Si wafer), ν (cm^{-1}): 2958 (Alkyl C–H), 1770 (C=O), 1712 (C=O), 1385 (C–N), 1257 (Si–C). ^{1}H NMR (300 MHz, $CDCl_3$, δ, ppm, 25 °C): 8.19 (s, ArH, 2H), 8.05 (s, ArH, 4H), 7.33 (d, J=8.7 Hz, ArH, 4H), 7.01 (d, J=8.7 Hz, ArH, 4H), 4.00 (t, J=6.0, $–CH_2–$, 4H), 3.35 (s, –C≡C*H*), 1.89–1.77 (m, $–CH_2–$, 4H), 1.59–1.48 (m, $–CH_2–$, 4H), 0.65–0.59 (m, $–CH_2–$, 4H), 0.11 (s, $Si–CH_3$, 12H), 0.07 (s, $Si–CH_3$, 12H). ^{13}C NMR (75 MHz, $CDCl_3$, δ, ppm, 25 °C): 167.2, 159.2, 145.5, 133.4, 133.2, 131.8, 128.0, 124.7, 124.0, 122.6, 115.2, 81.9, 68.5, 68.0, 32.8, 19.8, 18.0, 1.40, 0.368. Anal. Calcd. For $–(C_{44}H_{54}N_2)_n–$: C, 60.94; H, 6.28; N, 3.23. Found: C, 60.50 ; H, 6.18 ; N, 3.11.

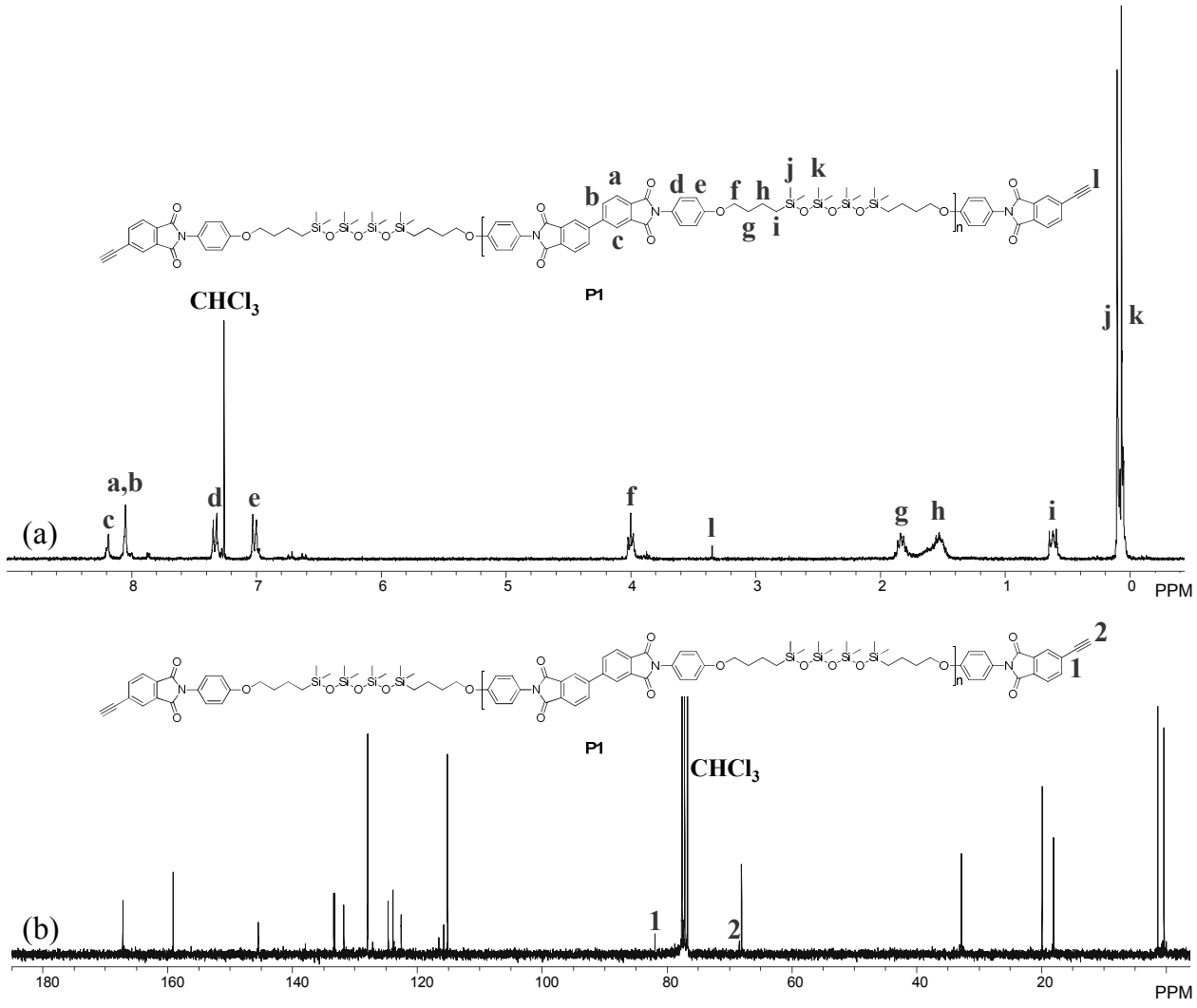

Figure S1. (a) ^{1}H and (b) ^{13}C NMR spectra of non cross-linked **P1** in $CDCl_3$.

Experimental data for **P2**. IR (Si wafer), ν (cm^{-1}): 2958 (Alkyl C–H), 1774 (C=O), 1716 (C=O), 1381 (C–N), 1254 (Si–C). ^{1}H NMR (300 MHz, $CDCl_3$, δ, ppm, 25 °C): 8.23 (s, ArH, 2H), 8.08 (s, ArH, 4H), 7.12 (d, J=8.4 Hz, ArH, 4H), 6.89 (s, ArH, 2H), 6.86 (d, J=8.4 Hz, ArH, 2H), 3.99 (t, J=6.3 Hz, $–CH_2–$, 4H), 2.19 (s, $–CH_3$, 6H), 1.88–1.79 (m, $–CH_2–$, 4H), 1.58–1.48 (m, $–CH_2–$, 4H), 0.65–0.60 (m, $–CH_2–$, 4H), 0.11 (s, $Si–CH_3$, 12H), 0.08 (s, $Si–CH_3$, 12H). ^{13}C NMR (75 MHz, $CDCl_3$, δ, ppm, 25 °C): 167.3, 160.0, 145.5, 137.9, 133.4, 133.3, 132.0, 129.7, 124.7, 122.8, 122.7, 117.1, 112.9, 67.9, 32.9, 19.9, 18.4, 18.1, 1.41, 0.379. Anal. Calcd. For $–(C_{46}H_{58}N_2)_n–$: C, 61.71; H, 6.53; N, 3.13. Found: C, 61.00 ; H, 6.25 ; N, 3.12.

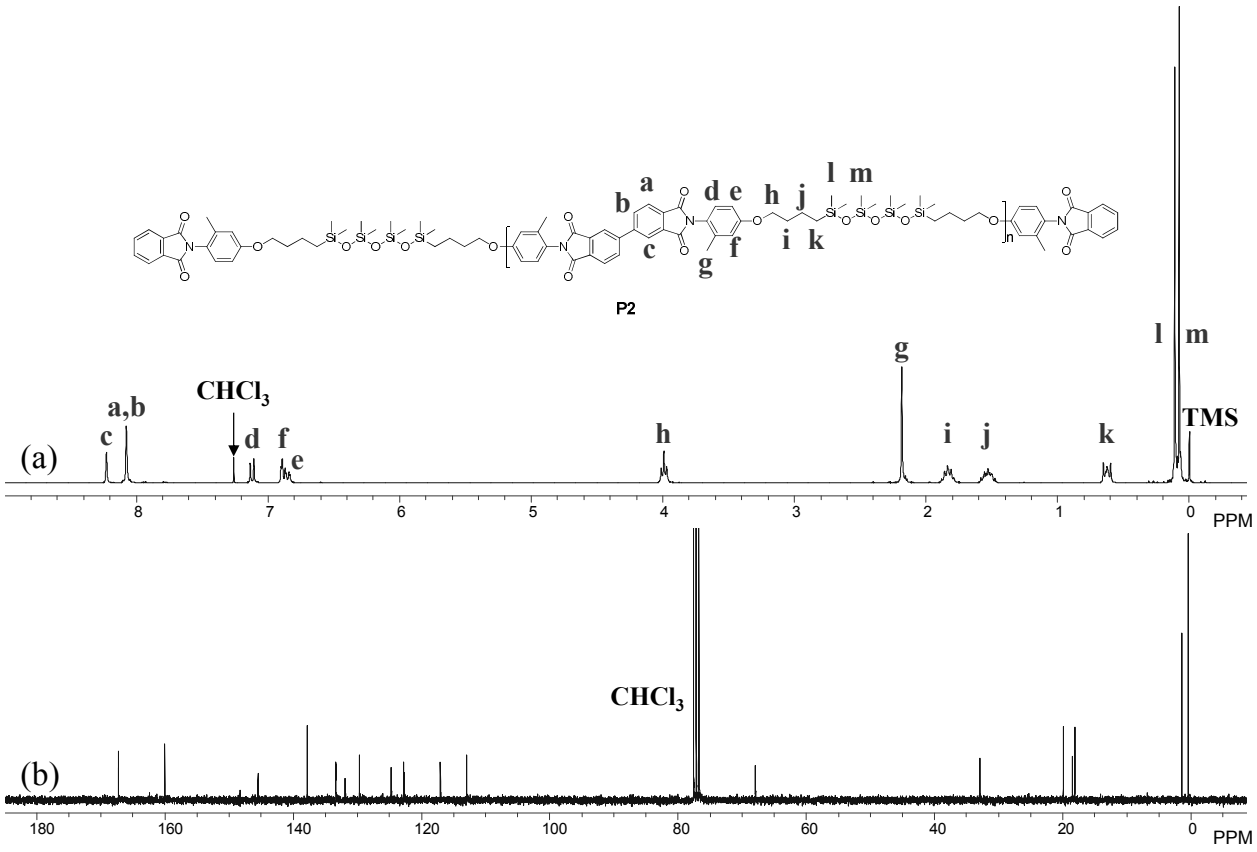

Figure S2. (a) ^{1}H and (b) ^{13}C NMR spectra of **P2** in $CDCl_3$.

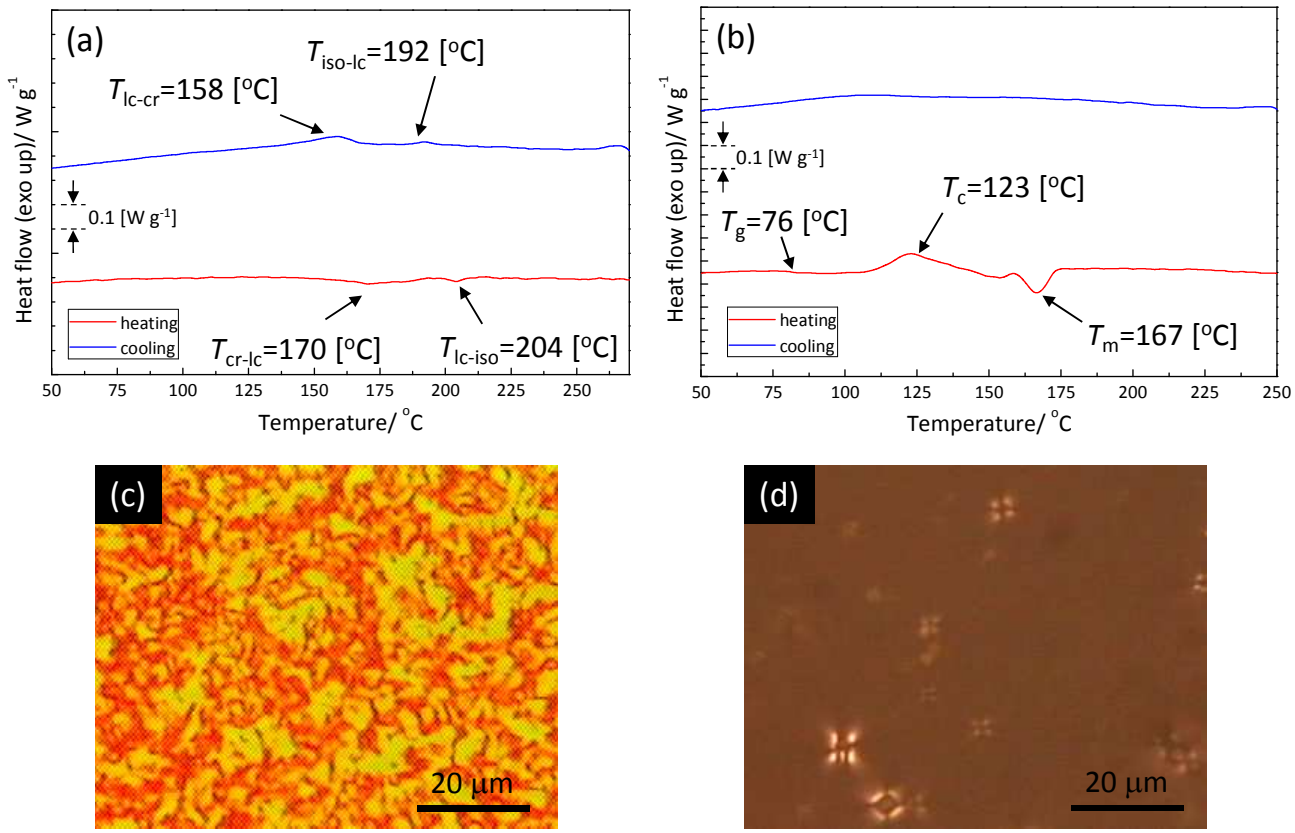

Figure S3. DSC traces for polyimide (a) **P1** and (b) **P2**. POM images of (c) **P1** and (d) **P2** at room temperature.

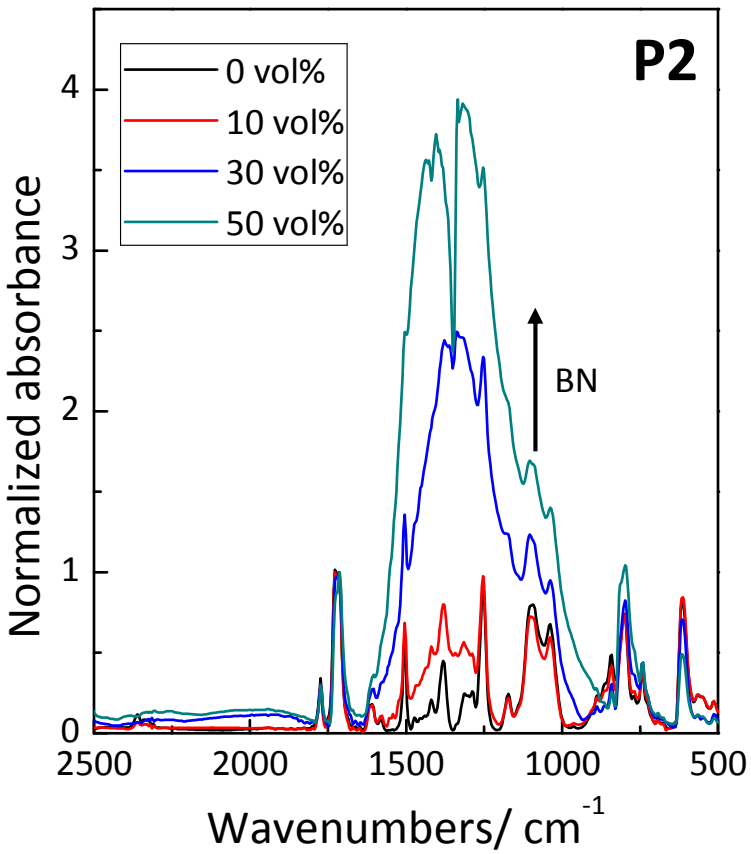

Figure S4. FT-IR spectra of h-BN composites of **P2**.

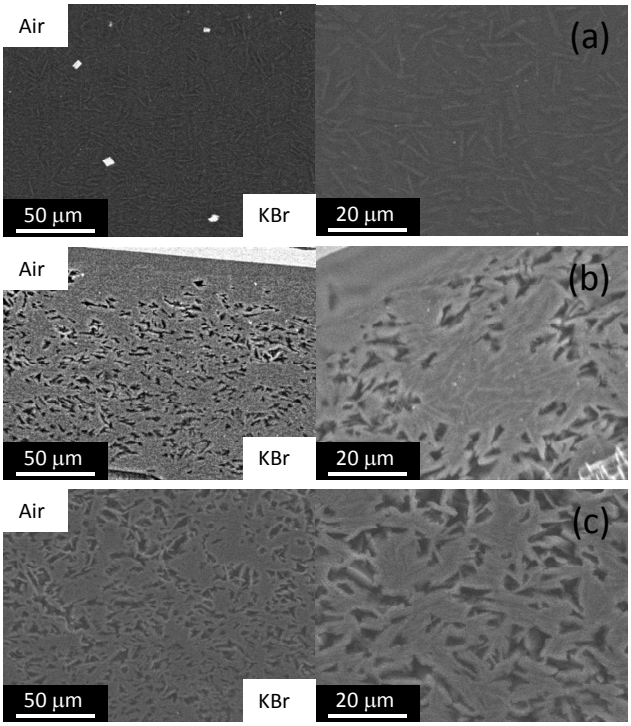

Figure S5. SEM images of cross-sectional area for the (a) 20 vol% and (b) 50 vol% h-BN composite films of **P1**, and the (c) 50 vol% h-BN composite film of **P2** (15.0 kV, ×600 (left) and ×1,500 (right)). Air interface side (upper) and KBr substrate side (bottom) in each figure.

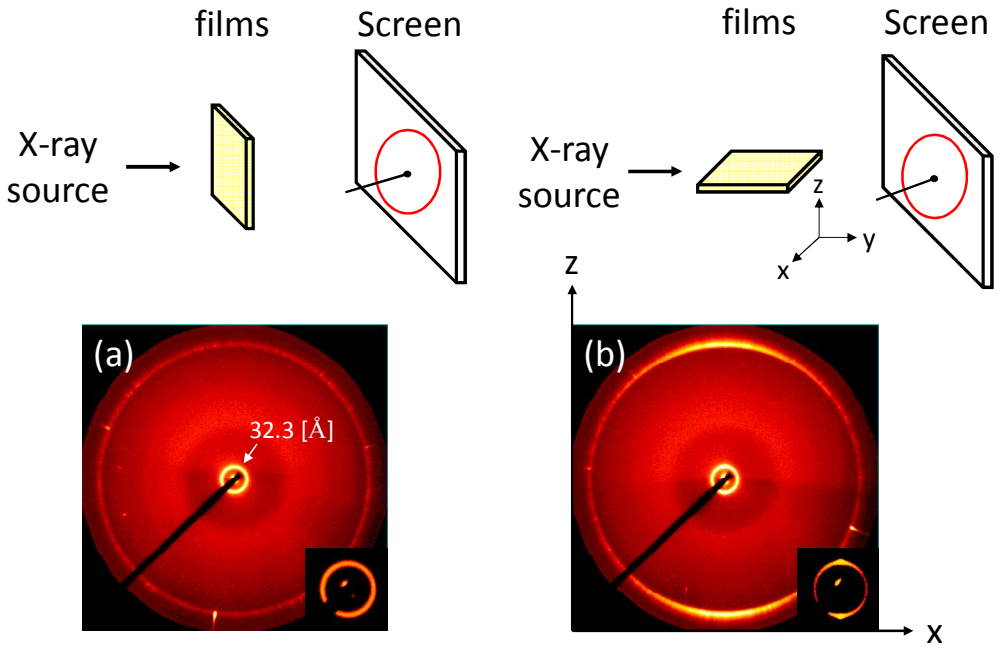

Figure S6. WAXD patterns (a) perpendicular and (b) parallel to the film surface for the 20 vol% h-BN composite film of **P1**.

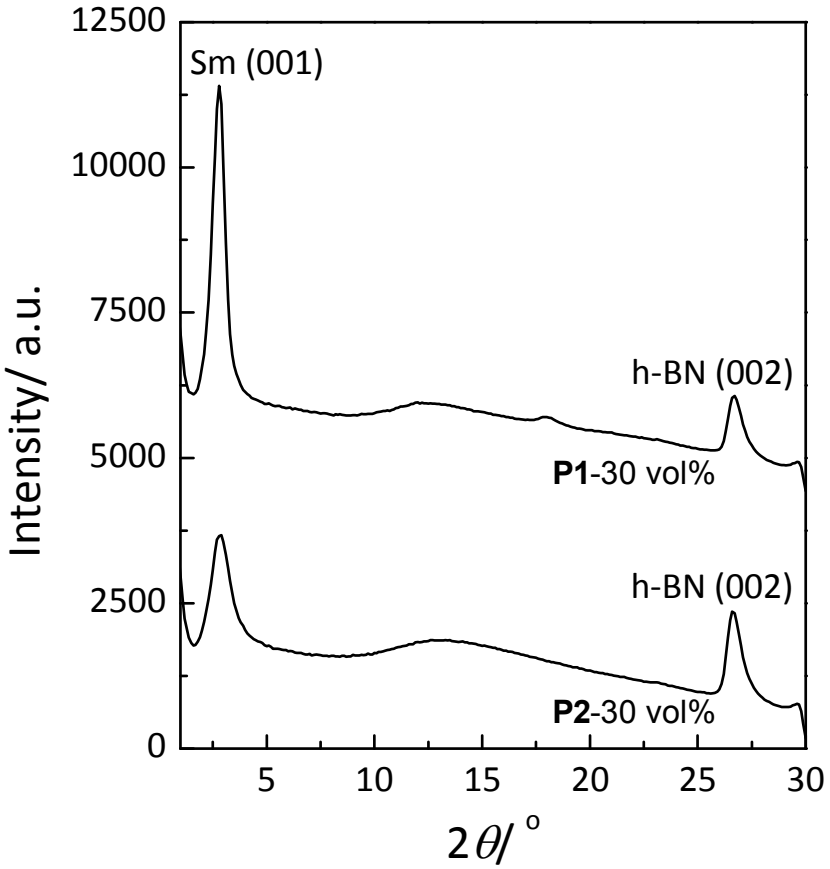

Figure S7. The intensity profiles of WAXD patterns by the beam irradiation perpendicular to the film surface for the 30 vol% h-BN composite films of **P1** (upper) and **P2** (bottom) against 2θ.

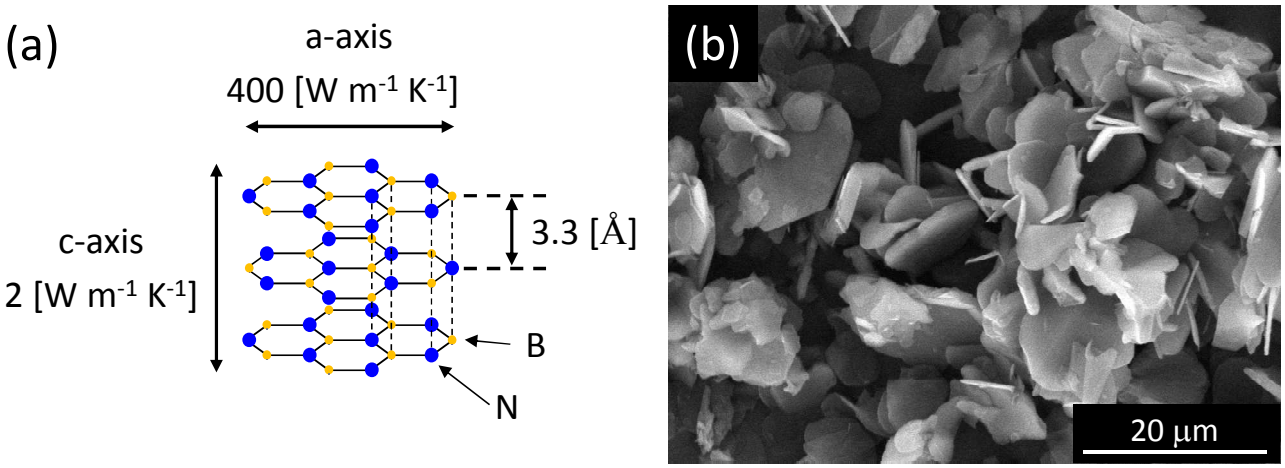

Figure S8. (a) The schematic illustration of the h-BN lattice structure and (b) the SEM image of the h-BN flakes.

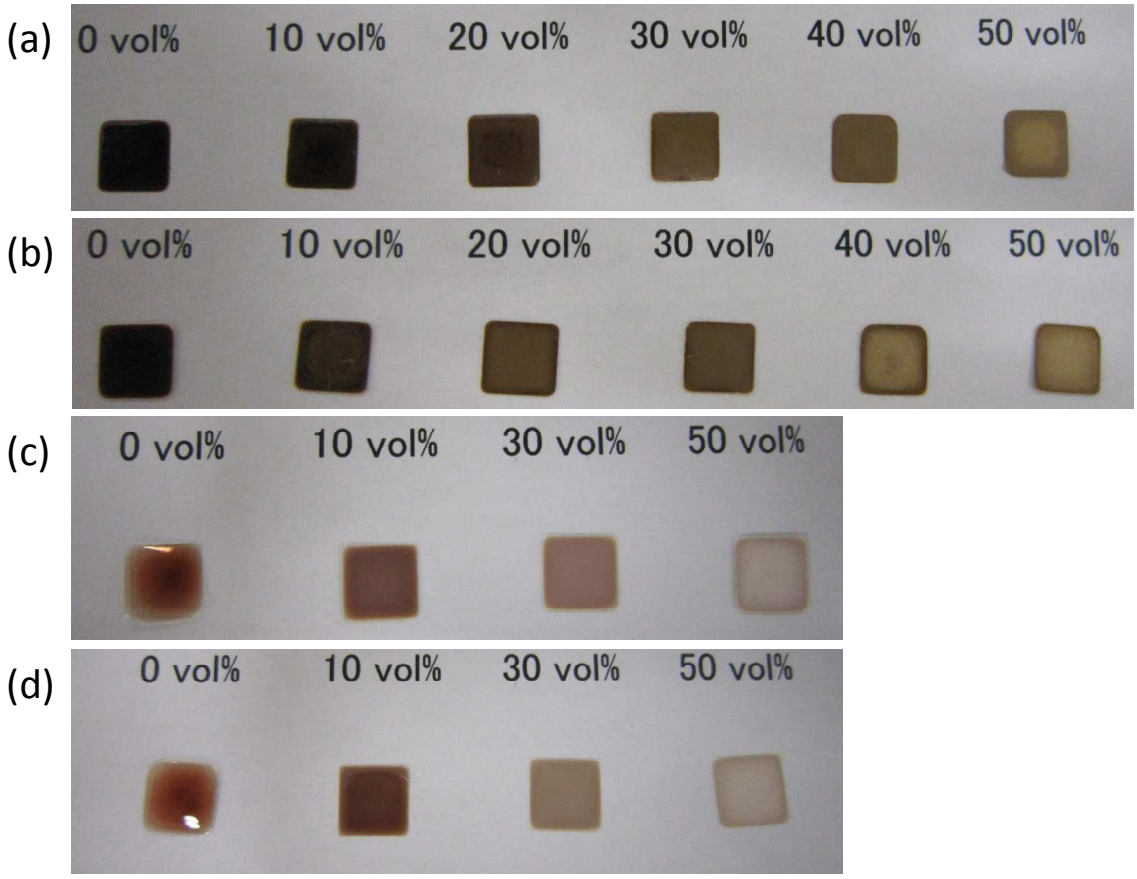

Figure S9. The photos of the obtained h-BN composite films: (a) air surface side of composite films of **P1**, (b) KBr substrate side of composite films of **P1**, (c) air surface side of composite films of **P2**, (d) KBr substrate side of composite films of **P2**.