Supporting information for

Full-Visible-Spectrum Emitters from Pyrolysis of Soluble Si-Si Bonded Network Polymers

Michiya Fujiki,[*,†] Yoshiki Kawamoto,[†] Masahiko Kato,[†] Yuji Fujimoto,[†] Tomoki Saito,[†] Shin-ichi Hososhima,[†] and Giseop Kwak[*,‡]

[†] *Graduate School of Materials Science, Nara Institute of Science and Technology, 8916-5 Takayama, Ikoma, Nara 630-0036, Japan, and*

[‡]*Department of Polymer Science, Kyungpook, National Uni*V*ersity, 1370 Sankyuk-dong, Buk-gu, Daegu 702-701, Korea*

* Corresponding author. Fax: 81-743-72-6049 (M.F.); 82-53-950-6623 (G.K.). Tel: 81-743-72-6040 (M.F.); 82-53-9507758 (G.K.). E-mail: fujikim@ms.naist.jp. (M.F.); gkwak@knu.ac.kr (G.K.).

† Nara Institute of Science and Technology.

‡ Kyungpook National University.

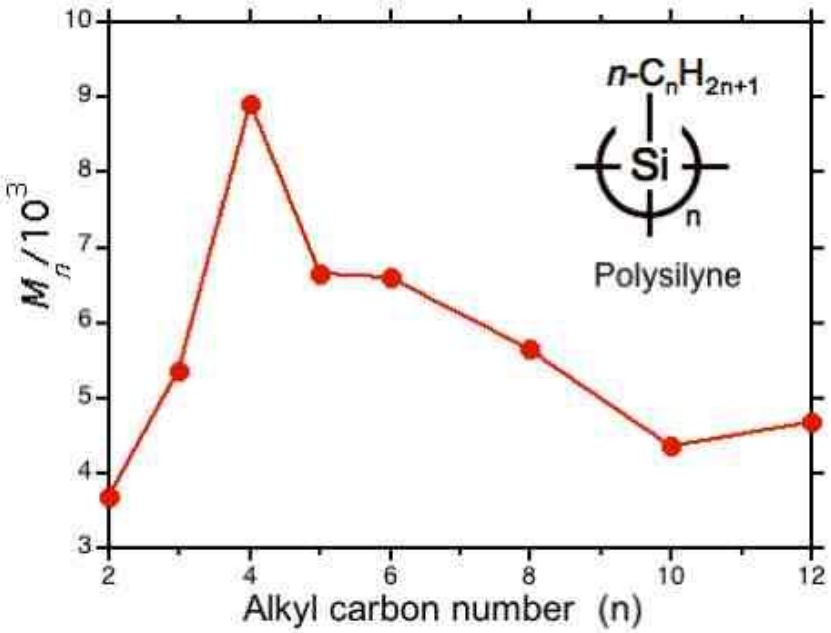


Figure S1. The molecular weights of silicon network polymer (SNP) prepared similarly to *n*-BSNP. In the case of $CF_3(CH_2)_2$-SNP, *n*-nonane was used as a polymerization solvent.

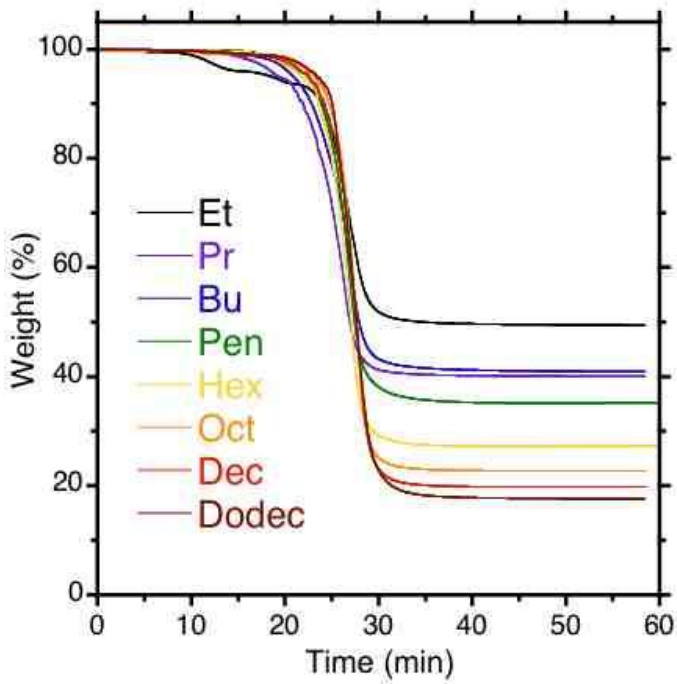
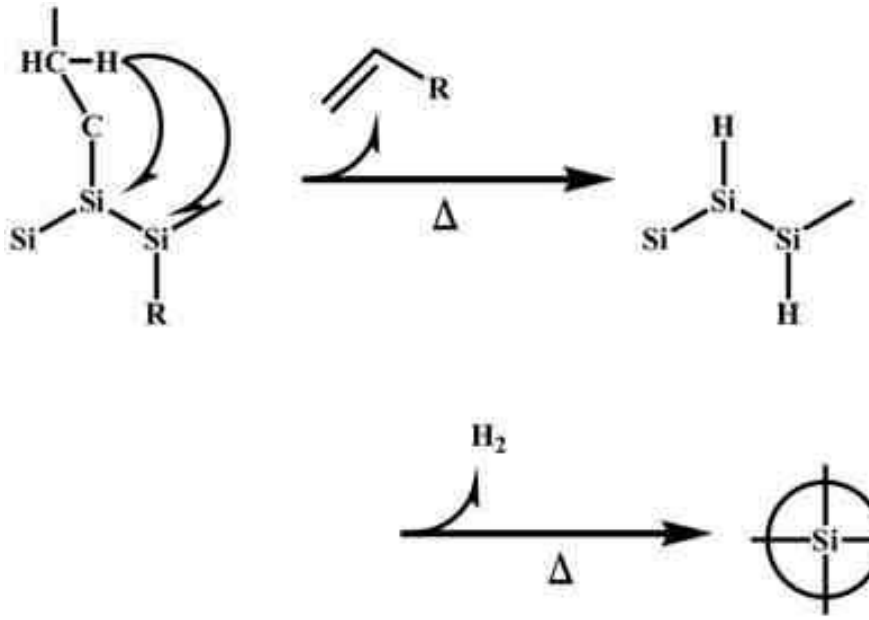


Figure S2. Weight loss data for eight SNPs with different alkyl chains at 500 °C as a function of time in N_2 atmosphere.



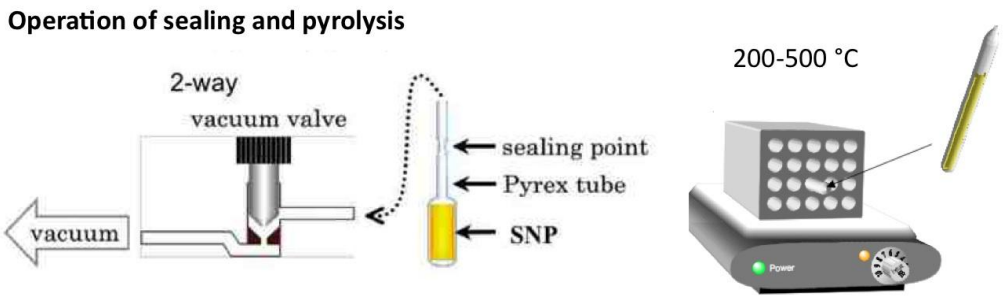


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Figure S1. Mechanism of β-H elimination of SNP and simple apparatus for pyrolysis of SNP in a sealed tube.

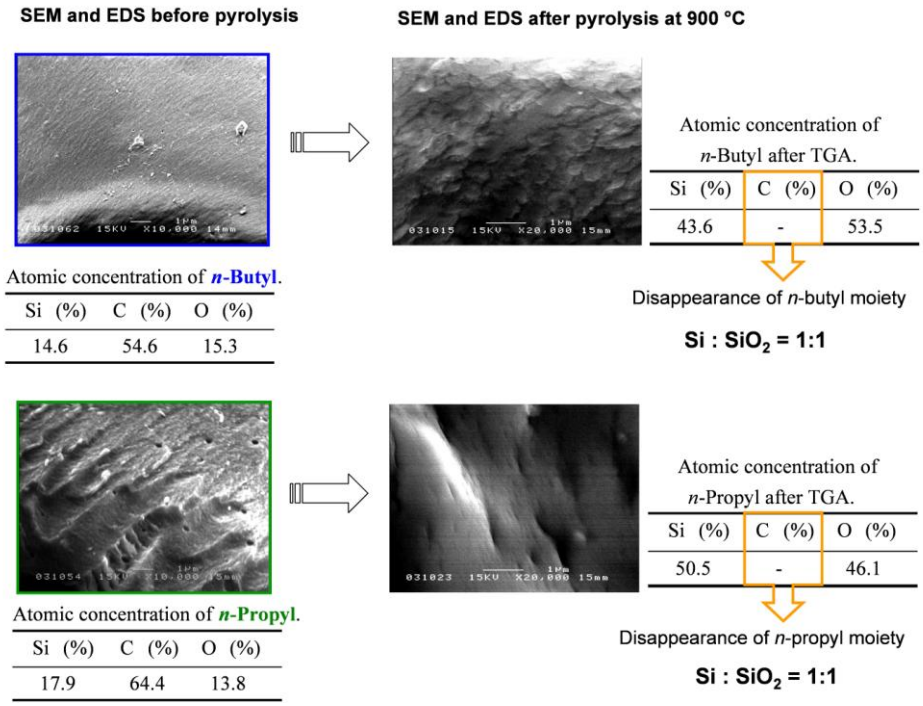

Figure S3. Surface analysis by SEM photographs and EDS of *n*-propyl-SNP and *n*-BSNP before and after pyrolysis at 900 °C.

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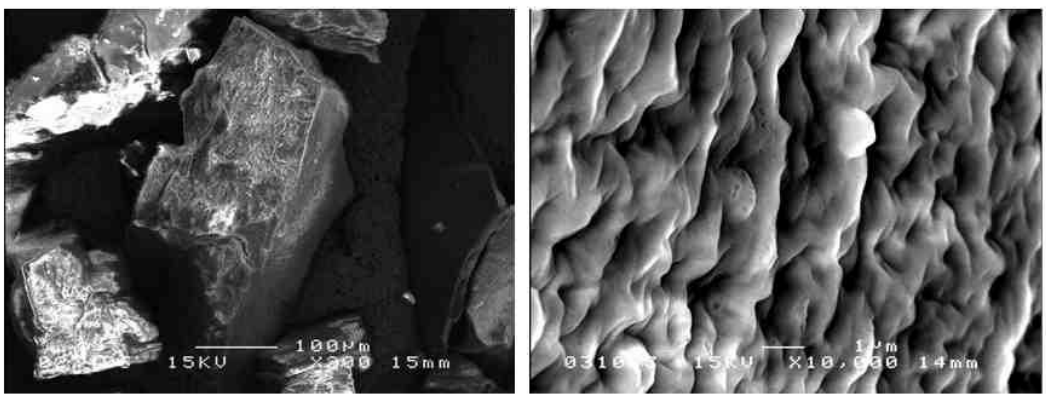


Figure S4. SEM photographs of *n*-propyl-SNP after pyrolysis at 900 °C in N_2 atmosphere.

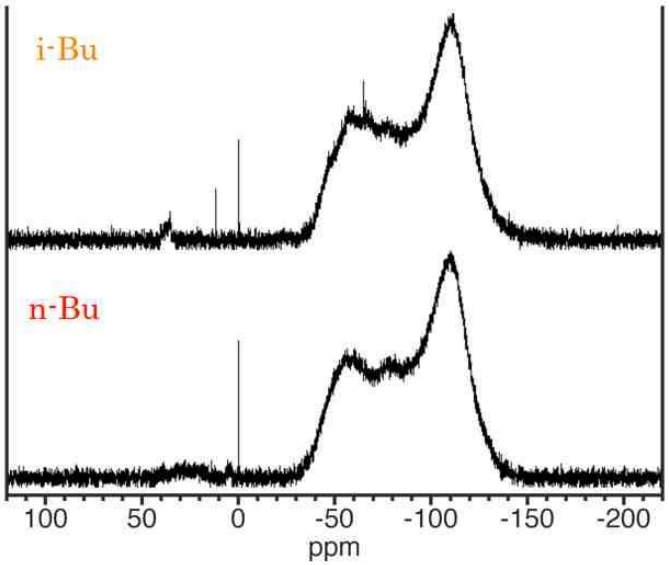


Figure S5. ^{29}Si-FT-NMR of *n*-BSNP and *i*-BSNP ($CDCl_3$, 25 °C).

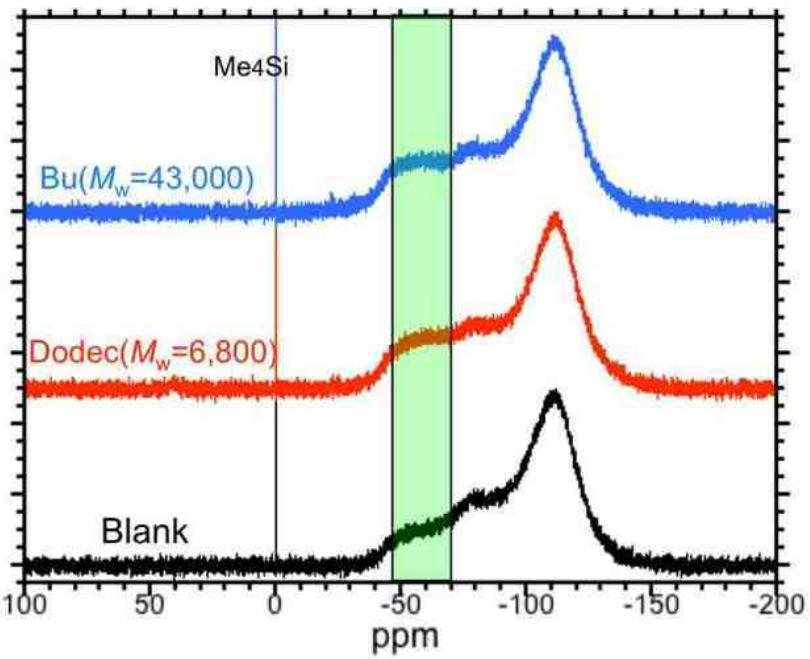


Figure S6. ^{29}Si-NMR of *n*-BSNP and *n*-dodecylSNP ($CDCl_3$, 25 °C). A very broad, humped Si-NMR signal around -50 ppm (green bar) implies very limited motion of Si-Si bonded networks. Broad ^{29}Si-NMR signals around -50, -80 ppm and -110 ppm are due to the glass of the NMR tube and probe.

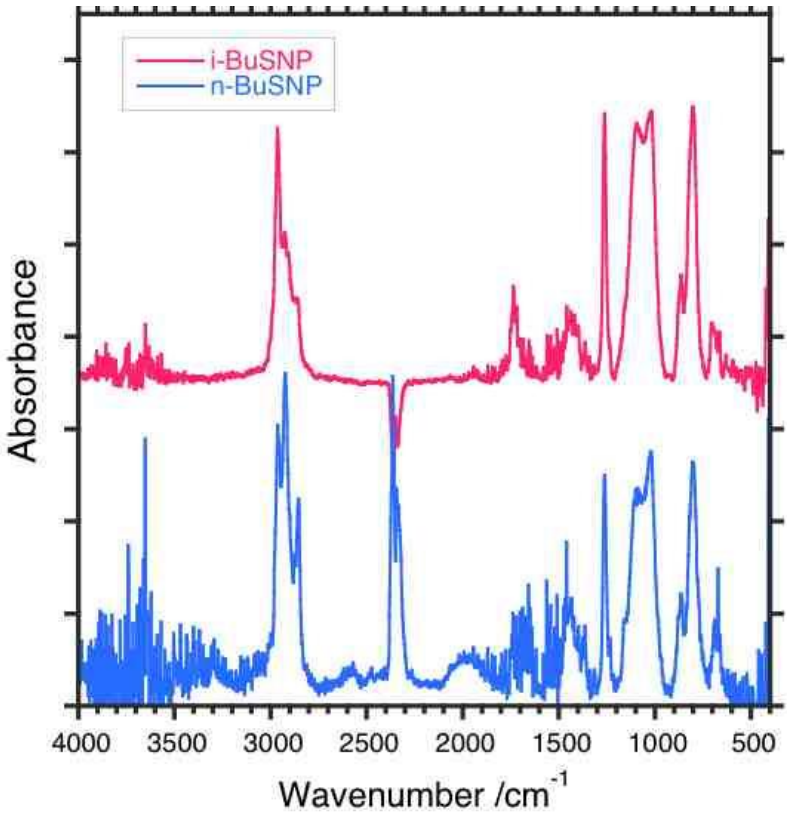


Figure S7. FT-IR spectra of *n*-BSNP and *i*-BSNP cast on a KBr plate.

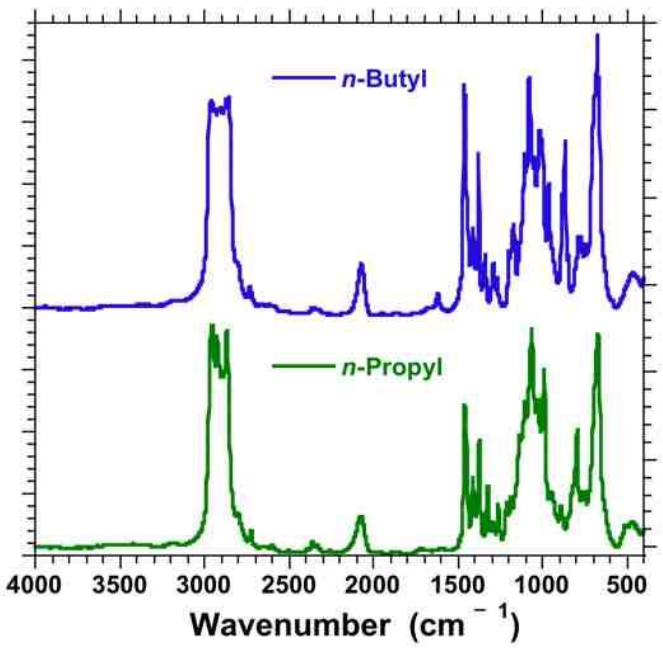


Figure S8. FT-IR spectra of *n*-BSNP and *n*-propyl SNP on a KBr plate.

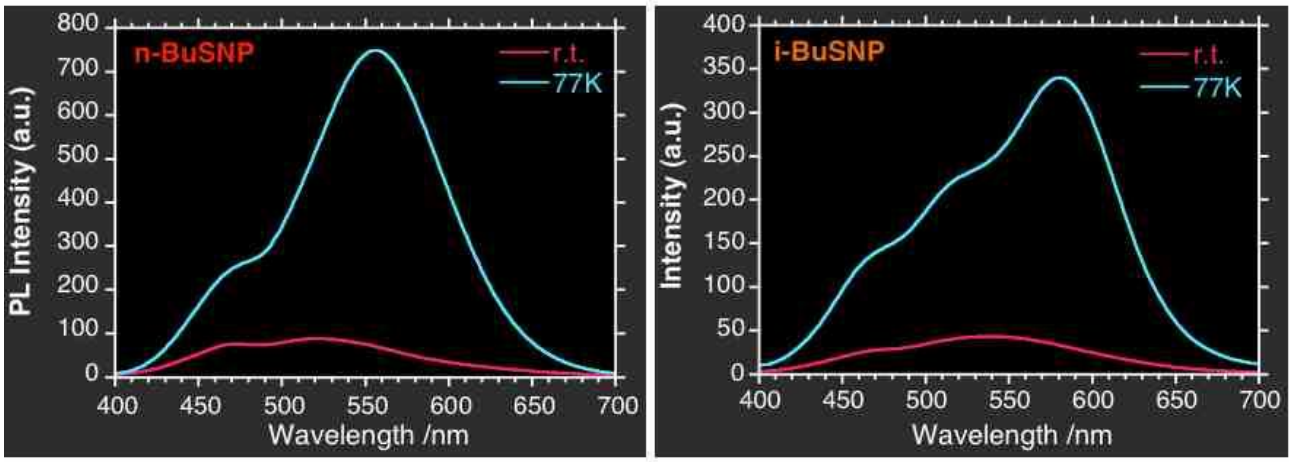


Figure S9. Change in PL intensity (under 360 nm excitation). Left, virgin *n*-BSNP film at 77 K and room temperature; right, *i*-BSNP film at 77 K and room temperature.

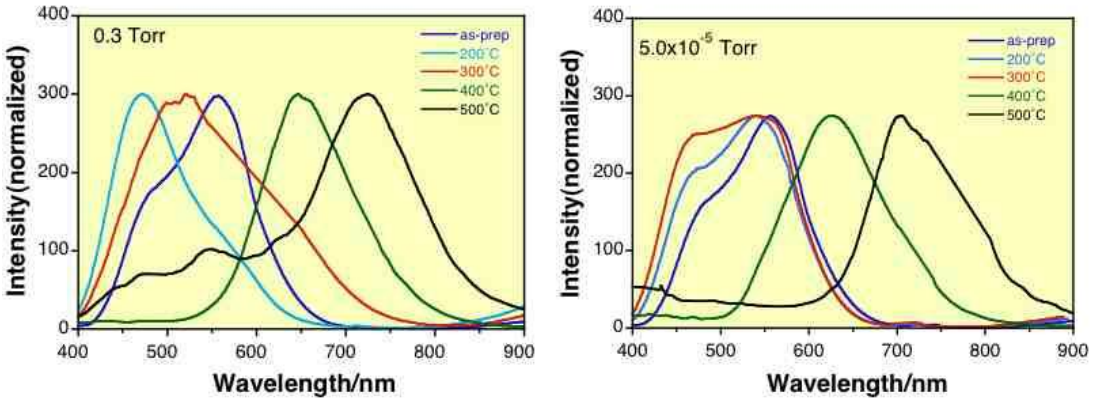


Figure S10. A comparison of PL spectra of *n*-BSNP treated with five different temperatures in two different vacuum conditions: Left at ~3×10^{-1} Torr and right at ~5×10^{-5} Torr.

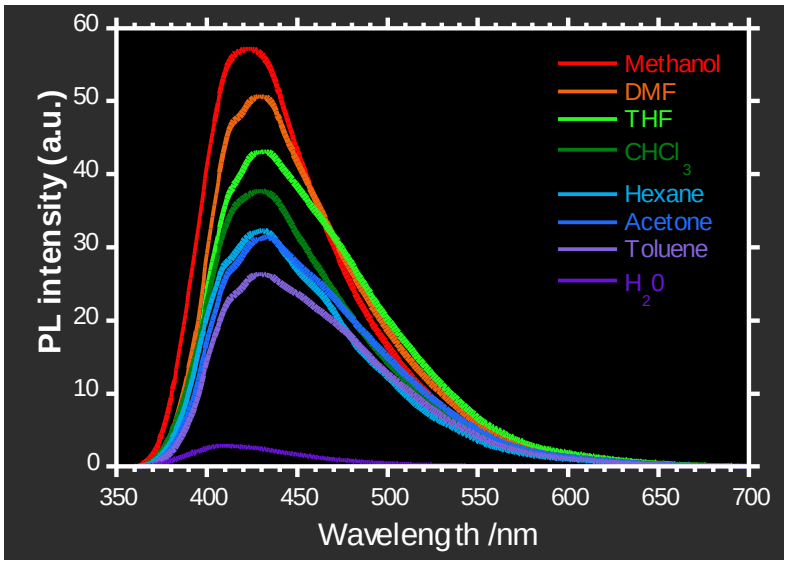


Figure S11. Change in PL intensity of the air-exposed *nc*-Si particles dispersed in solvent: from top to bottom, dimethylformamide, methanol, tetrahydrofuran, chloroform, toluene, acetone, and water.

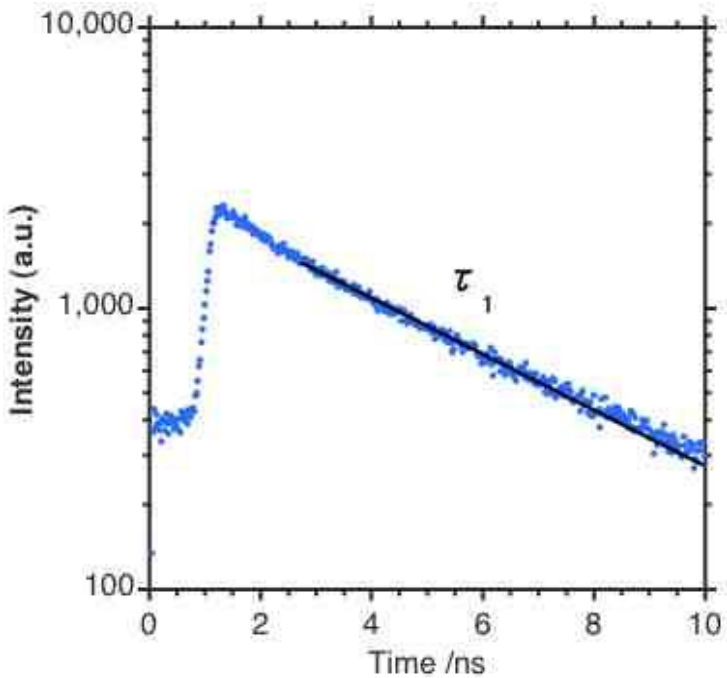


Figure S12. PL decay curve monitored at 560–640 nm (excited at 370 nm, 0.5 mW, pulse width 3 nm, pulse duration 10 nsec) of the air-exposed *nc*-Si particles (pyrolyzed at 500 °C, 90 min) dispersed in *n*-hexane at room temperature.

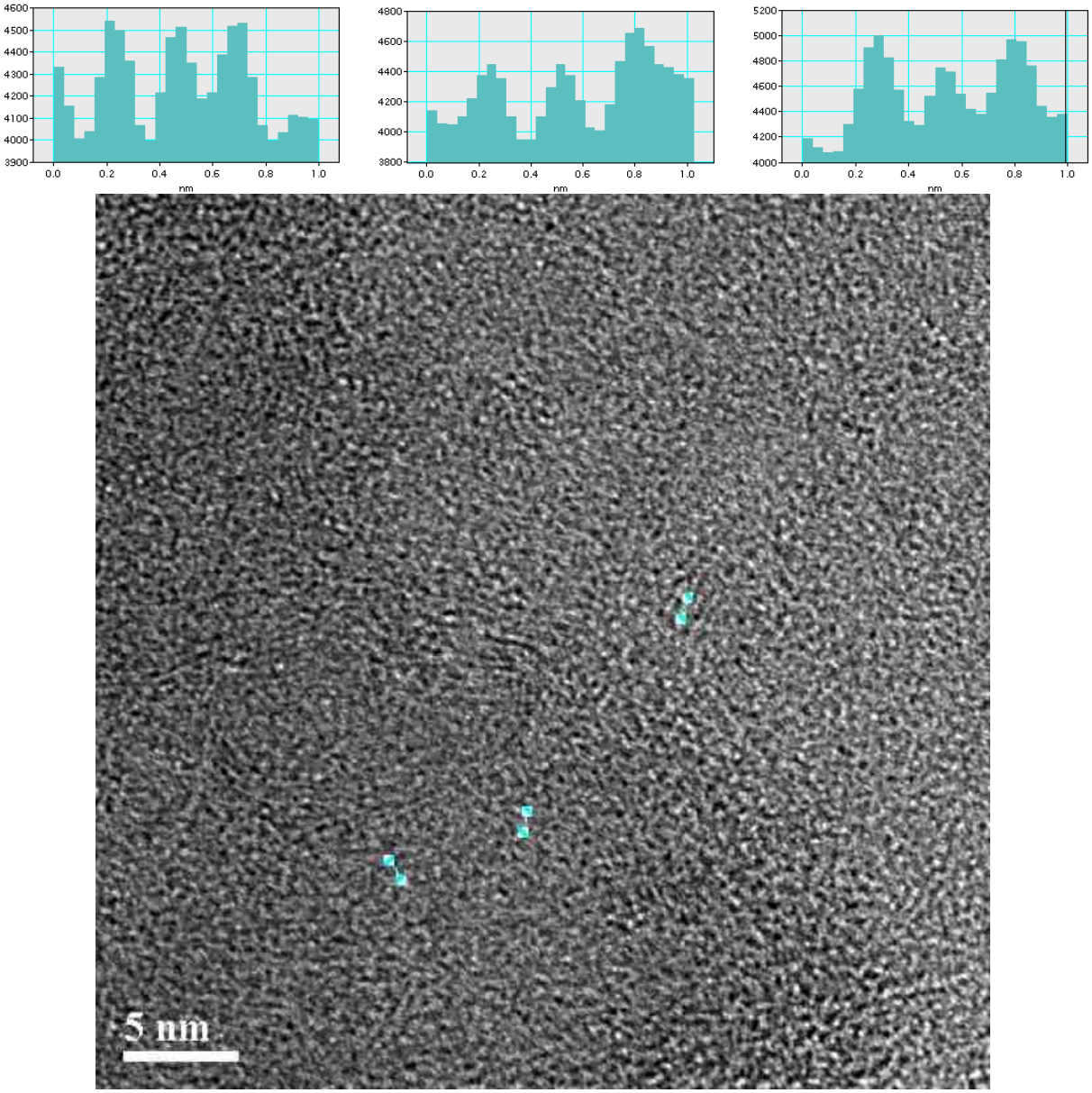


Figure S13. A highly magnified HRTEM image of the air-exposed *nc*-Si particles (the major portions may be ultrafine particles ~ 1 nm). (All plots surface profiles in locations indicated on HRTEM images).

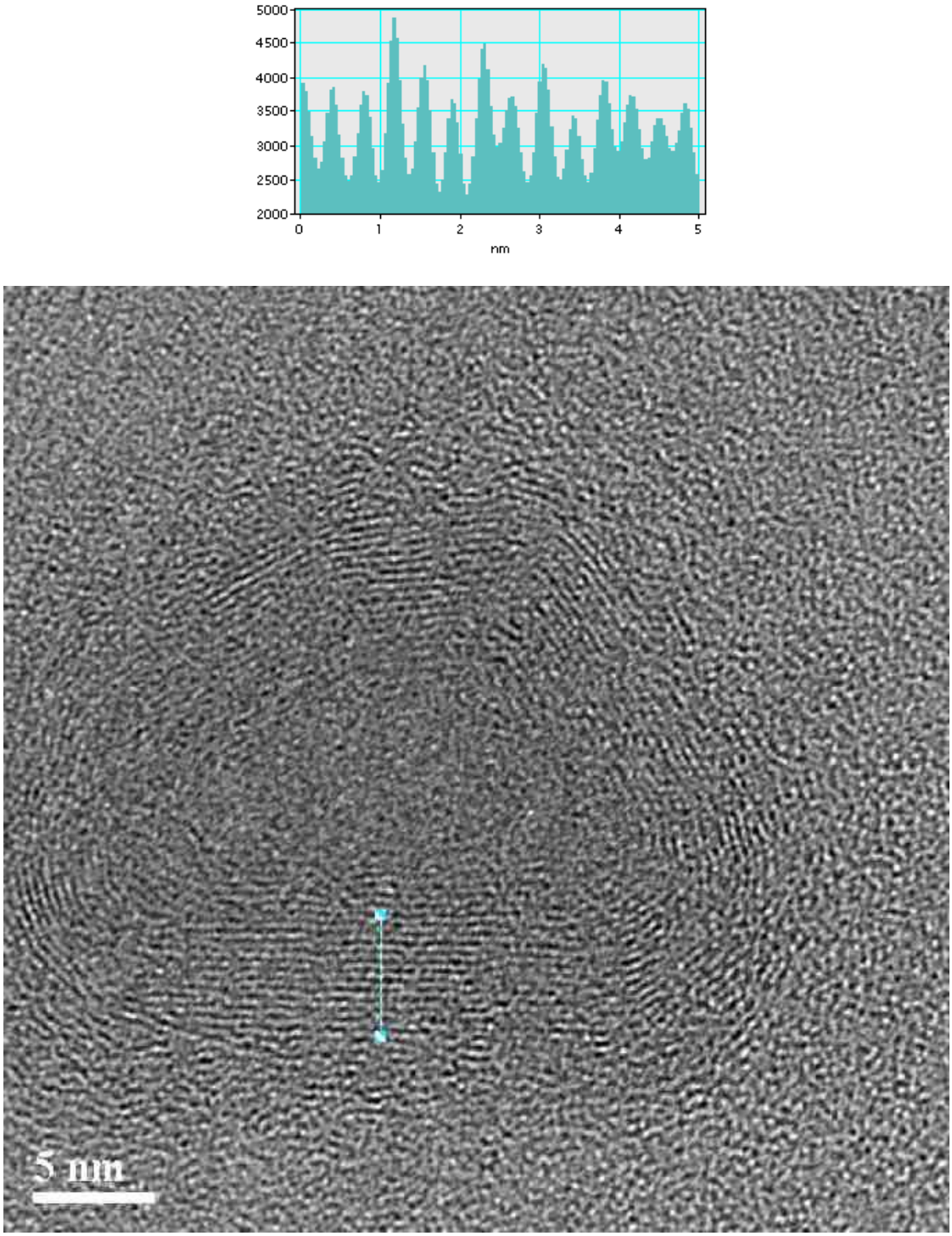
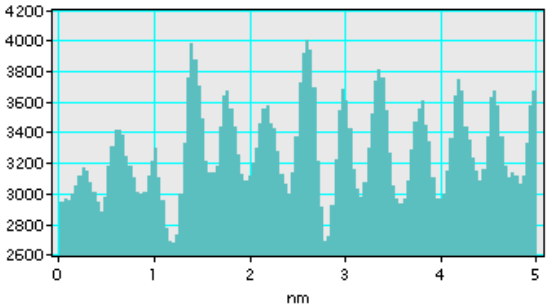


Figure S14. A highly magnified HRTEM image of the air-exposed *nc*-Si particles (baum-küchen-like, multi-layered structures, circular shapes with ~0.34 nm spacing). (Surface profile at indicated location).



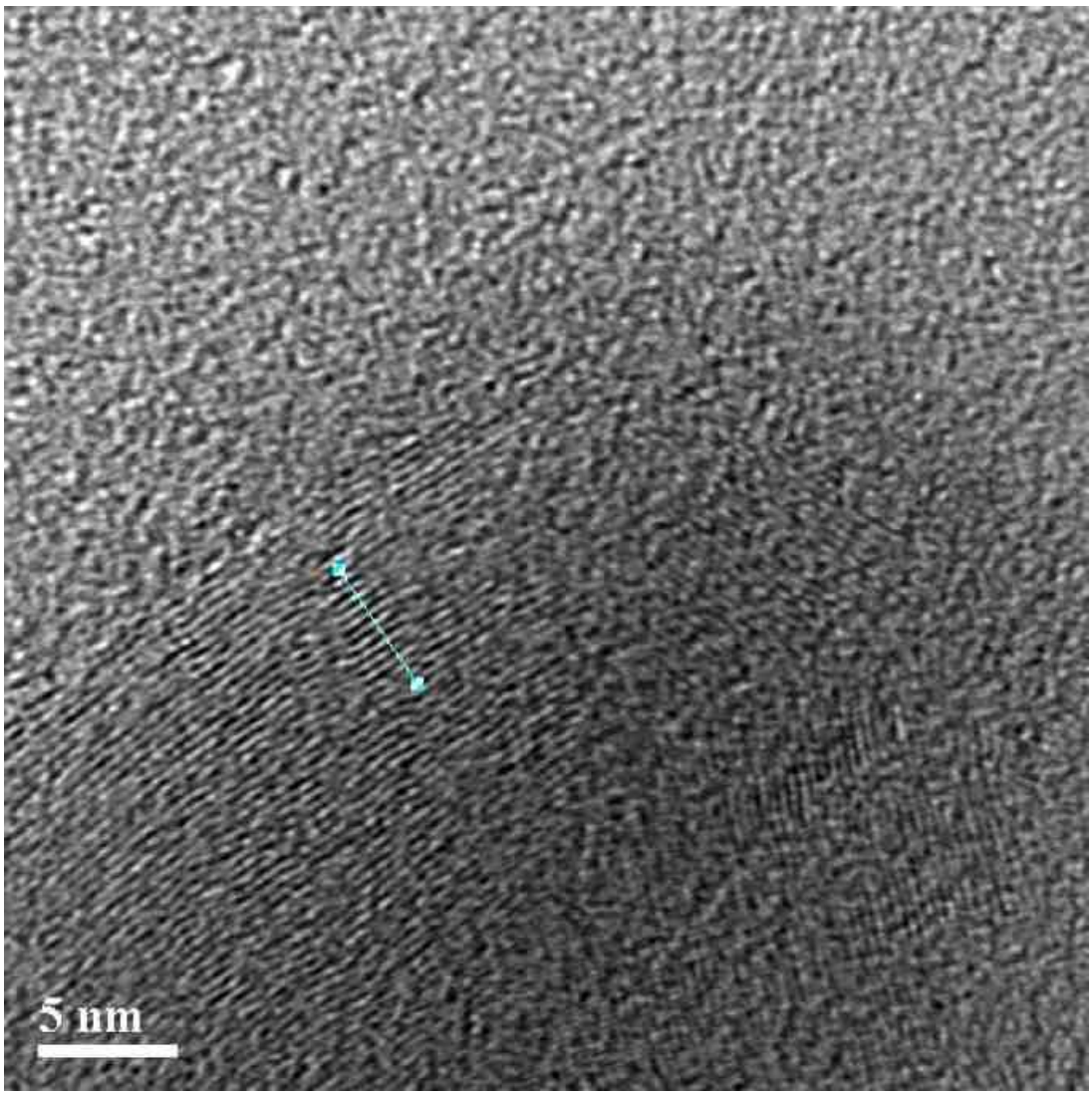
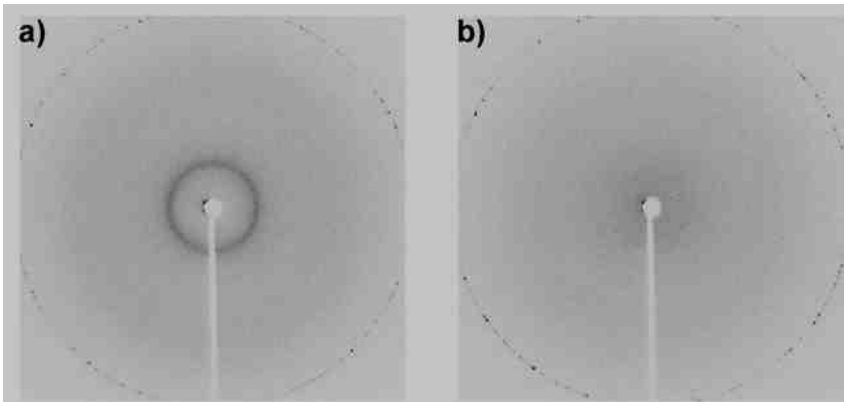
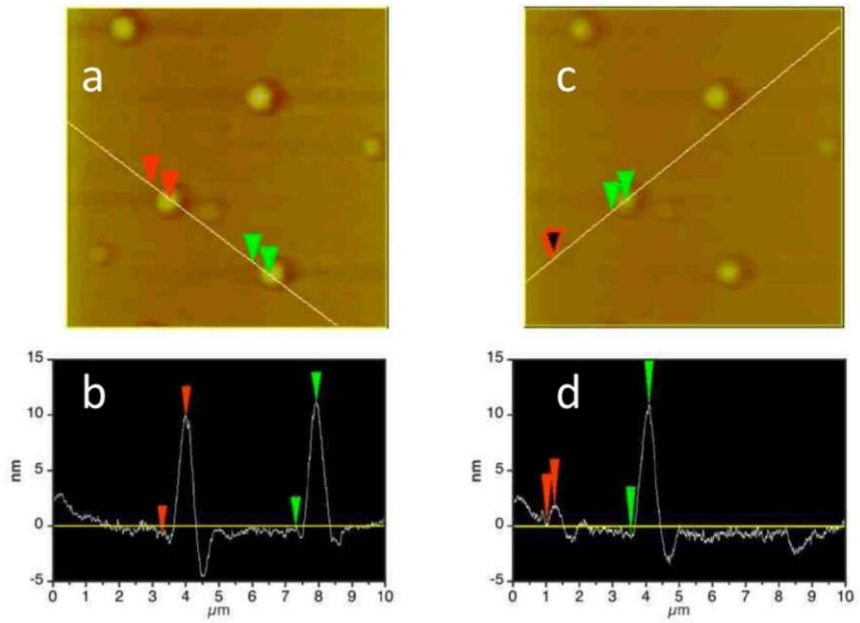


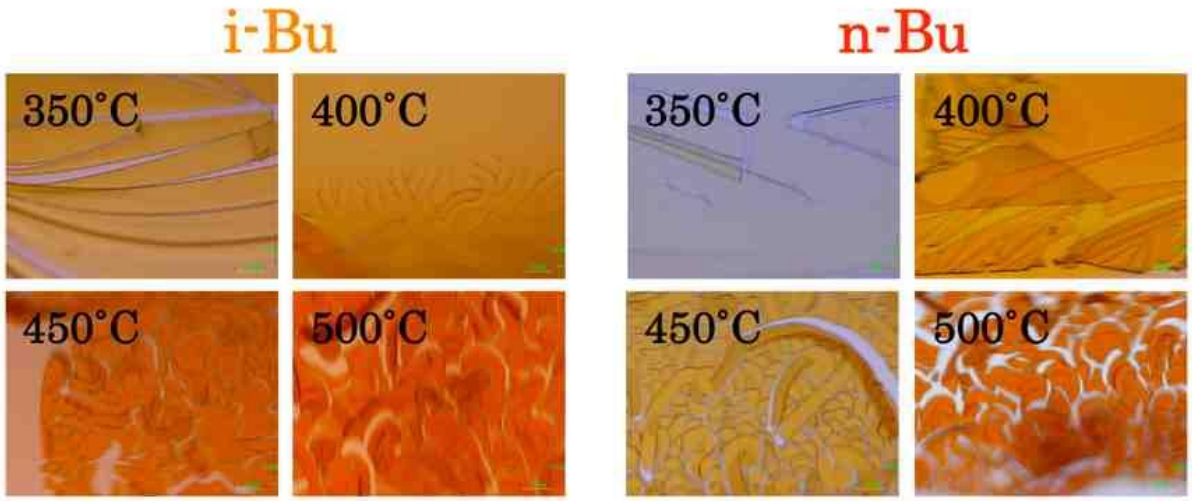
Figure S15. A highly magnified HRTEM image of the air-exposed nc-Si particles (baum-küchen-like, multi-layered structures, lamellar shapes with ~0.37 nm spacing). (Surface profiles at indicated location).



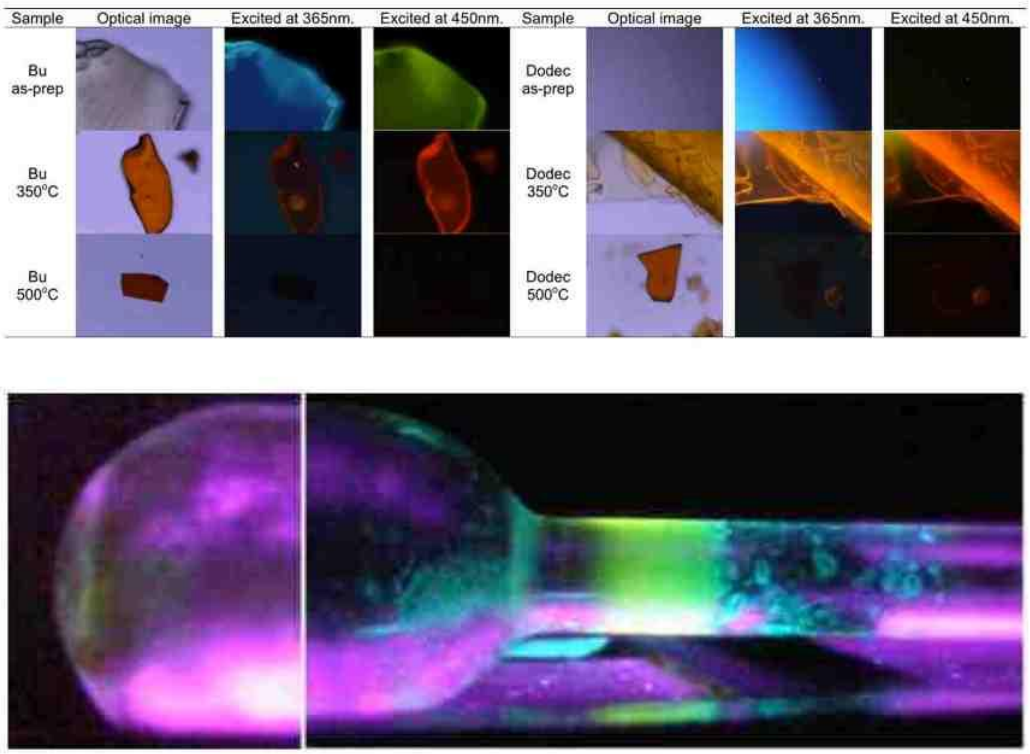
Figures S15a–b. Two-dimensional WAXD images of *n*-BSNP: a, before pyrolysis; b, after pyrolysis.



Figures S16. a-b. AFM images of the particles deposited on mica with several sizes of flat ring disk shapes, ranging from 1.5 to 10 nm in height and from 0.5 to 1 μm in diameter: **b–d**. Cross-section profiles of a and c, respectively.



Figures S17. Optical microscope (OM) images of *n*-BSNP and *i*-BSNP pyrolyzed at 350, 400, 450, 500 °C, indicating formation of macroscopically curved cracks as temperature increases.



Figures S18. Top, FOM images (x 40 magnification) of the pyrolysis samples of *n*-BSNP (top left) and *n*-dodecyl-SNP (top right) at 350 and 500 °C excited at 365 and 450 nm with exposure to air. Bottom, bright visible light emissions from the pyrolytic products of *n*-BSNP deposited onto the inner wall of a sealed quartz tube excited at 365 nm at room temperature.

Table S1. Molecular weights of soluble SNPs.[a]

Sample	M_n x 10^{-4}	M_w x 10^{-3}	PDI	Yield (%)
EtSNP	3.7	10.2	2.78	undetermined
n-PrSNP	5.4	18.7	3.49	37
n-BuSNP (*n*-BSNP)	8.9	42.4	4.75	39
n-PenSNP	6.6	17.5		undetermined
n-HexSNP	6.6	19.8	3.00	undetermined
n-OctSNP	5.7	13.9	2.46	undetermined
n-DecSNP	4.4	7.7	1.75	undetermined
n-Dodec-SNP	4.7	6.8	1.45	undetermined
i-BuSNP (*i*-BSNP)	2.4	4.0	1.67	18
$CF_3(CH_2)_2$-SNP (FPSNP)	2.8	3.1	1.10	undetermined

[a] Calibrated against polystyrene standards.