Supporting Documents

Chemical structures of DABA, BrVE/Sty, DABA-BrVE macromonomer and DABA-BrVE blend were confirmed by ^{1}H NMRand FT-IR spectroscopy. DABA-BrVE macromonomer dissolved in chloroform exhibits green fluorescence under UV (302 nm) exposure as well as in a powder form.

FT-IR spectra of DABA and DABA-BrVE macromonomer are shown in Figure S-1. Trace A illustrates the spectrum of DABA, whereas Trace B is the spectrum of DABA-BrVE macromonomer. The band at 1667 cm^{-1} in Trace B is due to C=O stretching vibrations of amide groups, which shifts to lower energy due to H-bonding associations of C=O and -NH groups of the neighbouring segments. Also, the disappearance of the bands at 1735 and 679 cm^{-1} due to the CH_2=C=O stretching vibrations indicate chemical crosslinks of DABA and two BrVE-Sty backbones. The band at 939 cm^{-1} is attributed to a trans-conformation, whereas the 780 cm^{-1} band is due to cis-conformation of the vinylene bonds of BrVE-Styrene. The broad band centred at 3420 cm^{-1} is due to the intermolecular hydrogen bonding between the two neighbouring DABA-BrVE macromonomers. Trace B of DABA-BrVE also shows expected bands at 3046, 3015, (aromatic C-H stretching), 2985, 2850, 2842 (aliphatic C-H stretching), 1510, 1181-1169 (aromatic C=C stretching), 1261 (C-O stretching, esters), 1101 (CH_3 rocking vibration), and 830 cm^{-1} (skeletal vibrations).

^{1}H NMR spectra of DMAA (Trace A), DABA (Trace B), BrVE/Sty (Trace C), DABA-BrVE macromonomer (Trace A') and the control DABA-BrVE blend (Trace B') are shown in Figure S-2 and S-3. The detailed spectral analysis is provided in the Experimental Section of the Main Document and confirms all structural features. The disappearance of vinyl protons at 5.4 and 5.9 ppm present in the BrVE and the appearance of new resonance at 2.64-2.96 ppm manifest DABA crosslinking to the

BrVE-Styrene backbone. Also, the resonance proton of amide at 8.32 ppm, aromatic protons of styrene at 6.74, and the azobenzene at 6.74-7.87 ppm exhibit shifts towards 8.02 ppm. The doublet at 5.62 and 6.16 ppm due to the vinylic protons indicates the presence of cis-trans conformations.

In an effort to determine structural features of DABA-BrVE resulting in yellow color (Trace A-1), and color change to purple (Trave A-3) upon 302 nm UV radiation, ^{1}H NMR analysis was performed. There are nodetectable changes in ^{1}H NMR resonances after 10 and 15 min UV exposure as well as after heating at 65^{o}C (Trace A-1'). This is illustrated in Figure S-4. These observations show that there is absence of photodegradation indicating that only structural changes are responsible for color changes. Thesecycles were repeated at least ten times in chloroform solutions and five times in a solid phase without photodegradation.

Figure Captions

Figure S-1. ATR FT-IR spectra of A- DABA; B- DABA-BrVE macromonomer.

Figure S-2. ^{1}H NMR spectra of A- DMAA; B- DABA; C- BrVE/Sty.

Figure S-3. ^{1}H NMR spectra of A'- DABA-BrVE macromonomer; B'-DABA-BrVE blend.

Figure S-4. ^{1}H NMR spectra of DABA-BrVE macromonomer: A-1, before UV exposure; A-3, 10 min UV exposure; A-1', heating of A-3, 65^{o}C, 3 min.

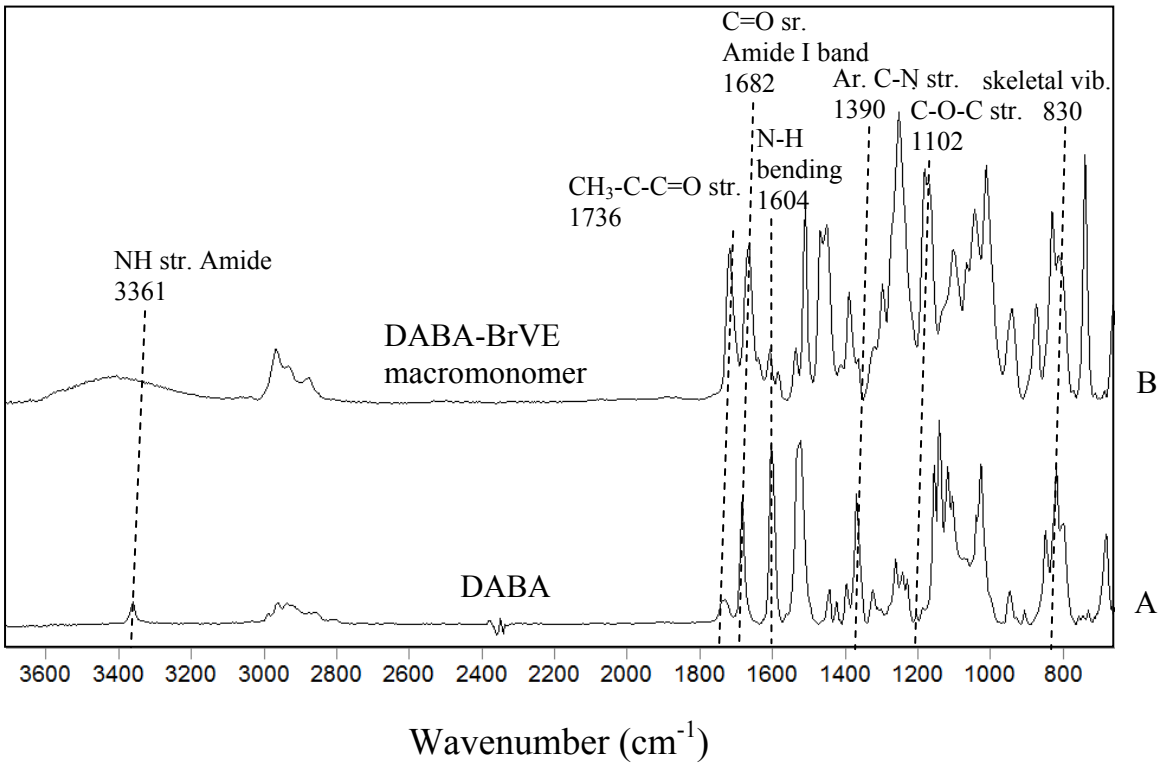

Figure S-1.

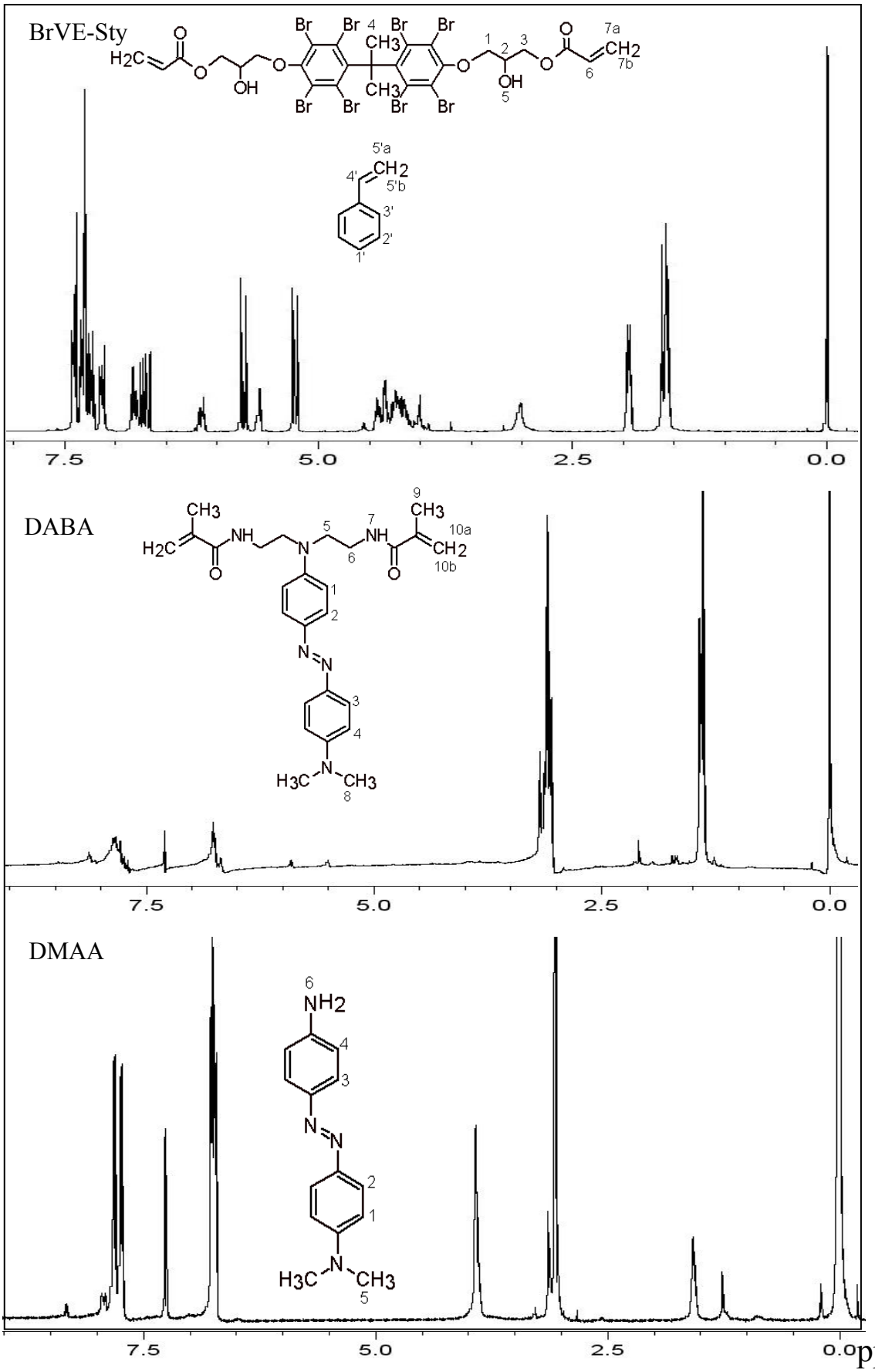

Figure S-2.

Supplementary M

DABA-BrVE Blend (c)

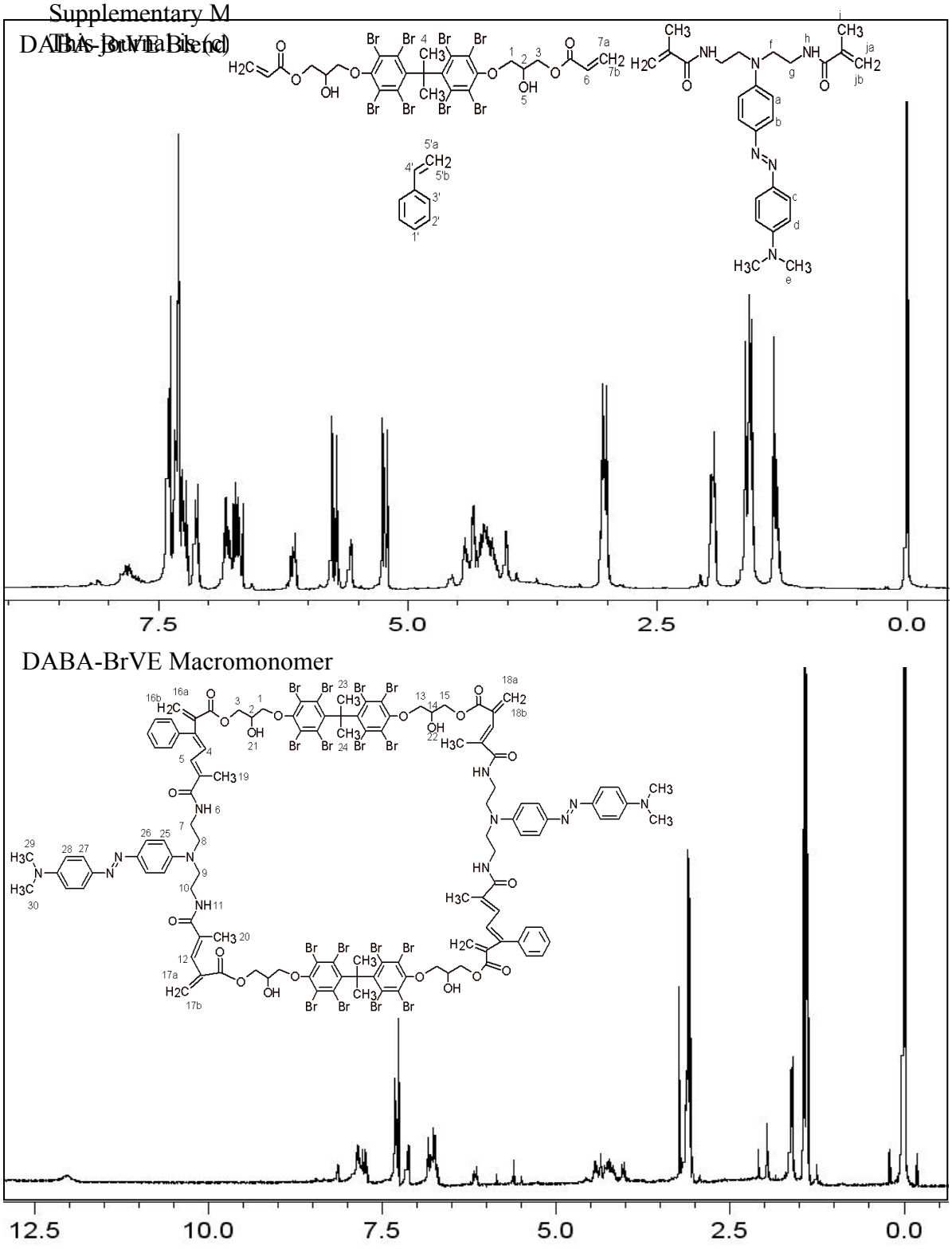

Figure S-3.

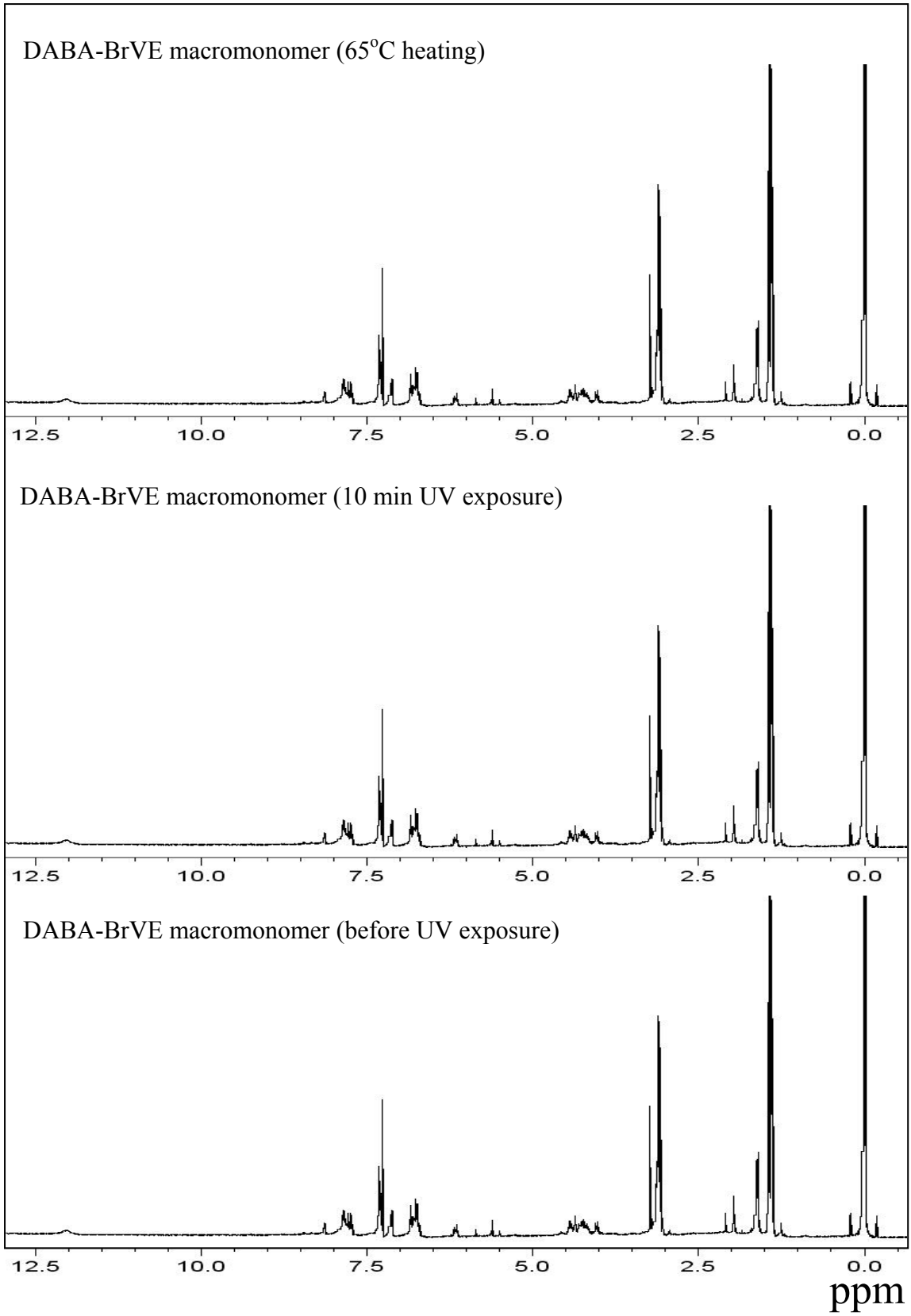
DABA-BrVE macromonomer (65°C heating)
A-1'
12.5
10.0
7.5
5.0
2.5
0.0
DABA-BrVE macromonomer (10 min UV exposure)
A-3
12.5
10.0
7.5
5.0
2.5
0.0
DABA-BrVE macromonomer (before UV exposure)
A-1
12.5
10.0
7.5
5.0
2.5
0.0
ppm

Figure S-4.

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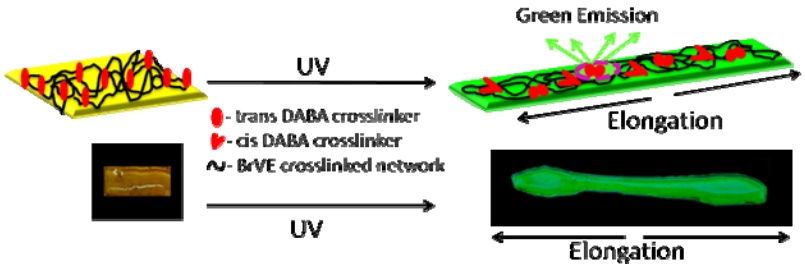

Fluorescence Emission upon Elongation