ESI

Multiscale additive manufacturing of polymers using 3D photo-printable self-assembling ionic liquid monomers

[1]Bineh G. Ndefru, [1]Bryan S. Ringstrand, [1] Sokhna I-Y. Diouf, [2]Sönke Seifert, [1]Juan H. Leal, [1]Troy A. Semelsberger, [1]Timothy A. Dreier, and [1]Millicent A. Firestone*

[1]Materials Physics & Applications Division, Los Alamos National Laboratory, Los Alamos, NM USA 87545

[2] X-ray Sciences Division, Argonne National Laboratory, Lemont, IL USA 60439

[(*)] Author to whom correspondence should be addressed:

Millicent A. Firestone
Materials Physics & Applications
Los Alamos National Laboratory
P.O. Box 1663
Los Alamos, NM 87545
Phone: 505-695-8837
E-mail: firestone@lanl.gov

Fig. S1. Dynamic mechanical analysis (DMA) of 3D printed poly[$C_{10}VIm^{+}$-*co*-PEGDA][Cl^{-}] (post-processed with 1 h UV exposure post printing) at 1.00 Hz. Storage modulus (E') and tan δ range from 1475 MPa at -100 °C to 5 MPa at 80 °C (black octagons) and 0.16 at -100 °C to 0.24 at 80 °C (red spheres), respectively. The room temperature (20 °C) storage modulus is 60MPa.

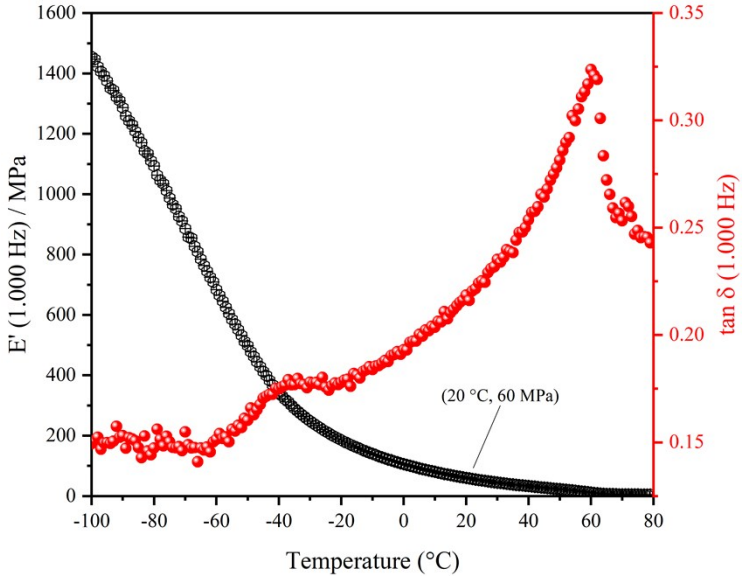

Fig S2. Drawings used for the 3D printing a honeycomb and Los Alamos National Laboratory logo. The size of the prints derived from the .stl files are shown in the figure below (black) and compared to that experimental recorded post printing (red).

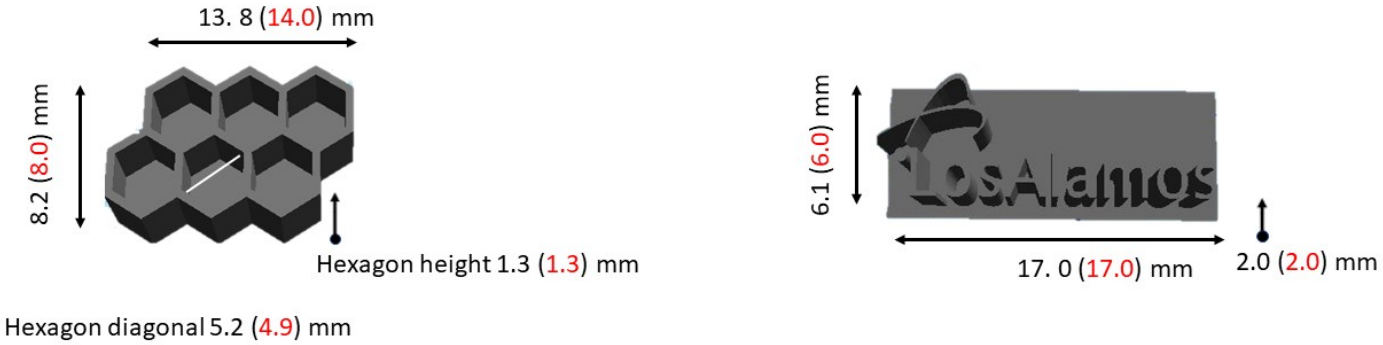

Fig. S3 SAXS profiles evaluating the effect of 10 (w/w) % PEDGA (blue curve), and 30 (w/w) % PEDGA (red curve) on mesophase structure.

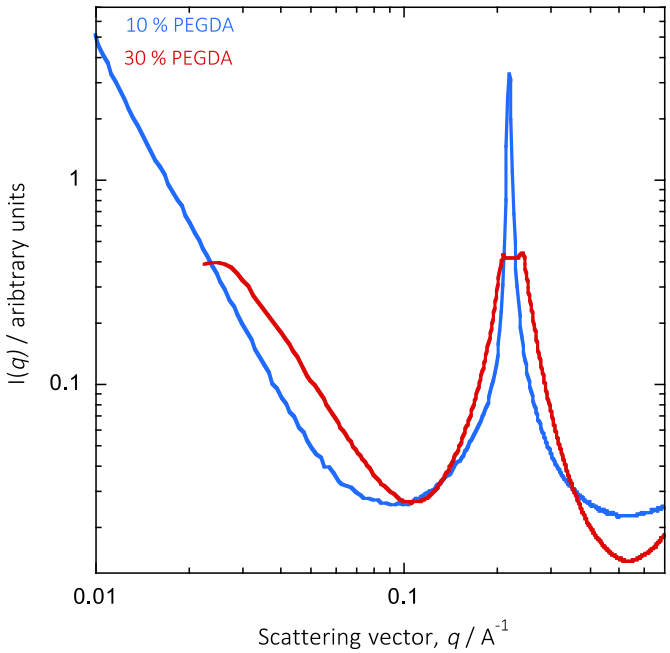

Fig. S4. Low Frequency ATR/FT-IR spectra recorded (A) the mesophase (black), a bulk polymerized poly[$C_{10}Vim^{+}$-*co*-PEGDA][Cl^{-}] (red), and a 3D printed poly[$C_{10}Vim^{+}$-*co*-PEGDA][Cl^{-}] (orange). (B) 3D printed poly[$C_{10}Vim^{+}$-*co*-PEGDA][Cl^{-}](no post-printing processing (blue) and post processed with 1 h UV exposure post printing (black). Vibrational modes associated with vinyl moiety of the ionic liquid monomer are indicated in orange and those assigned to the acrylate group of PEGDA in purple.

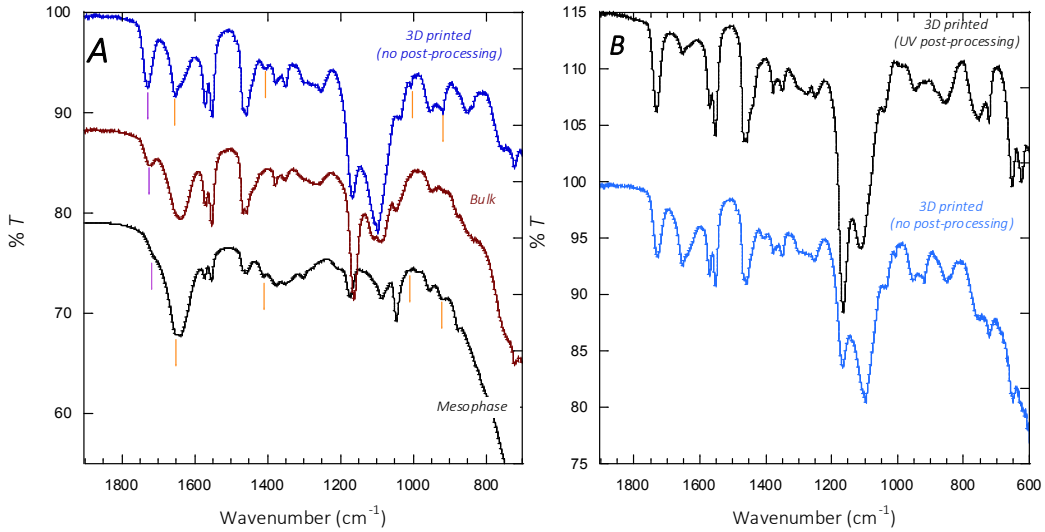

Fig. S5 TGA of 3D printed build (blue) compared to UV cured 3D printed build (orange).

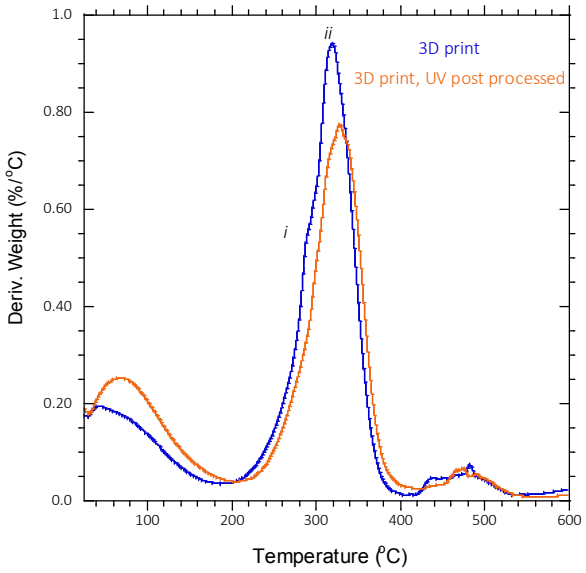

Fig. S6. SAXS profiles collected and used for estimation of pore dimensions. A representative SAXS profile collected on a post-UV cured build (blue curve) and an ethanol swollen planar build (black curve).