Supplementary Material (ESI) for Nanoscale

Electronic supplementary information for

Polyelectrolyte and carbon nanotube multilayers made from ionic liquid solutions

Takuya Nakashima,[a] Jian Zhu,[a] Ming Qin,[a] Szushen Ho,[a] and Nicholas A. Kotov[abc]*

[a] Department of Chemical Engineering, University of Michigan, Ann Arbor, Michigan 48109, USA.E-mail: kotov@umich.edu

[b] Department of Biomedical Engineering, University of Michigan

[c] Department of Materials Science and Engineering, University of Michigan

1. Formation of aggregates of polyelectrolytes in [EMIm][$EtSO_4$]

The homogeneous clear solutions of PEI and PSS in [EMIm][$EtSO_4$] were mixed together to give an opaque solution, indicating the formation of polyelectrolyte complexes of PEI and PSS.

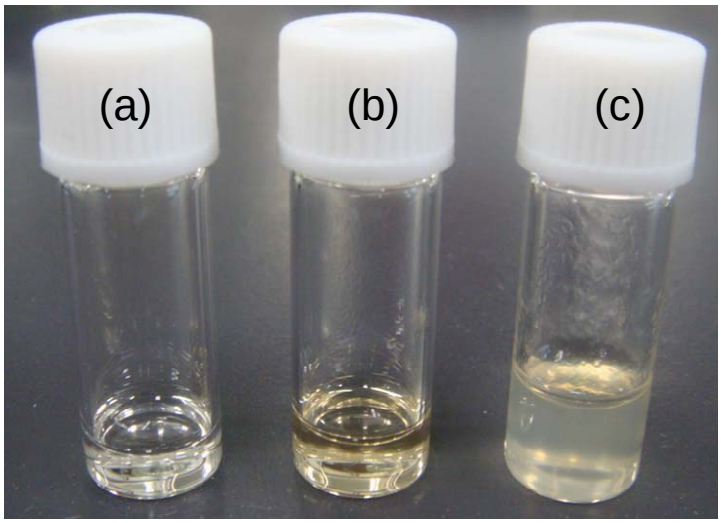

Figure S1. Photographs of (a) PSS, (b) PEI and (c) PEI/PSS mixture solutions of [EMIm][$EtSO_4$].

2. IR measurement for PEI/PSS LBL

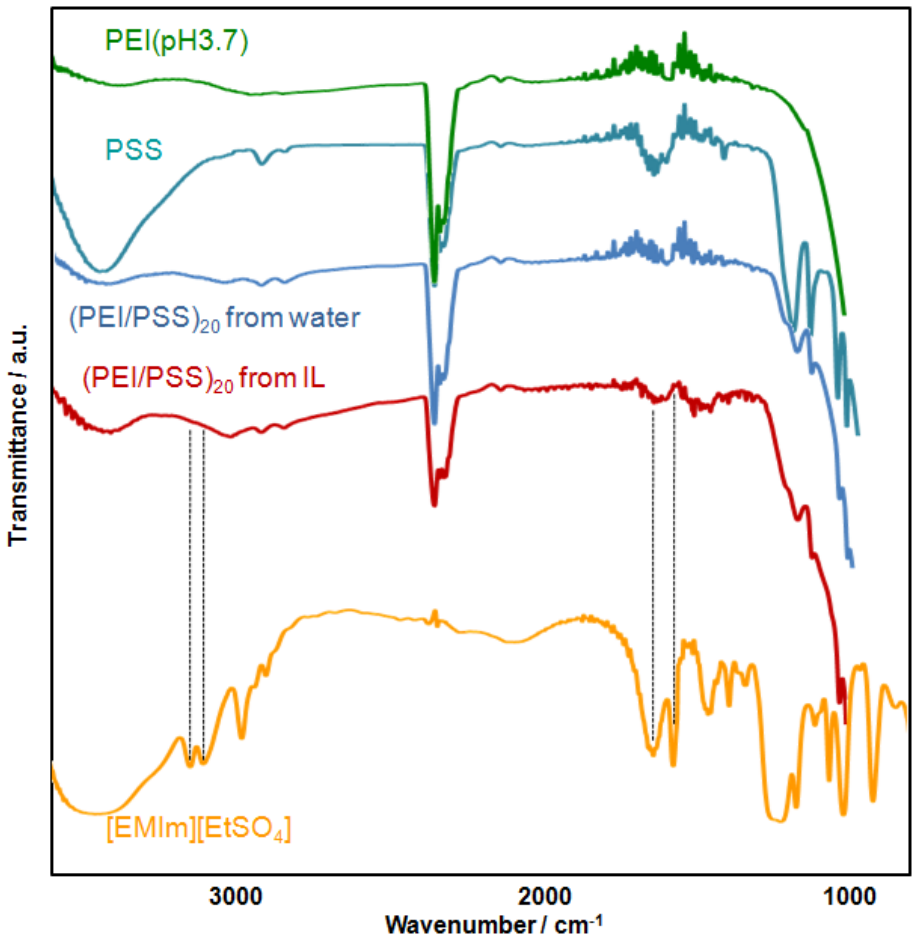

Figure S2. IR spectra of PEI, PSS casted on CaF_2, $(PEI/PSS)_{20}$ LBL films prepared from water and $[EMIm][EtSO_4]$ on CaF_2 and $[EMIm][EtSO_4]$.

Both $(PEI/PSS)_{20}$ LBL films prepared from aqueous solutions and from IL solutions exhibited quite similar profiles. The absence of peaks typical for $[EMIm][EtSO_4]$ such as ring-stretchings and C-H stretchings (C2-H, C4-H, C5-H, imidazolium ring) as denoted by dashed lines in Figure S2 indicates that the $(PEI/PSS)_{20}$ film prepared from IL solutions is free from $[EMIm][EtSO_4]$ contamination.

3. Static water-contact angle measurements

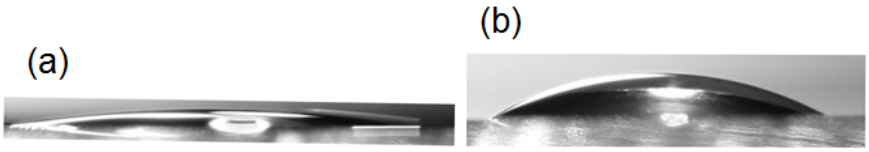

Figure S3. Photographs of water-droplet on the $(PEI/PSS)_{10}$ multilayer films prepared from (a) aqueous solutions and (b) [EMIm][$EtSO_4$] solutions.

The static contact angle of water droplet on the $(PEI/PSS)_{10}$ film prepared from IL solutions was measured to be 32 ± 3º (Figure S3b), which was clearly larger than that of LBL film prepared from aqueous solutions (12 ± 3º) (Figure S3a).

4. XPS measurement for [PVA/(SWNT-PSS)]$_{10}$ LBL film

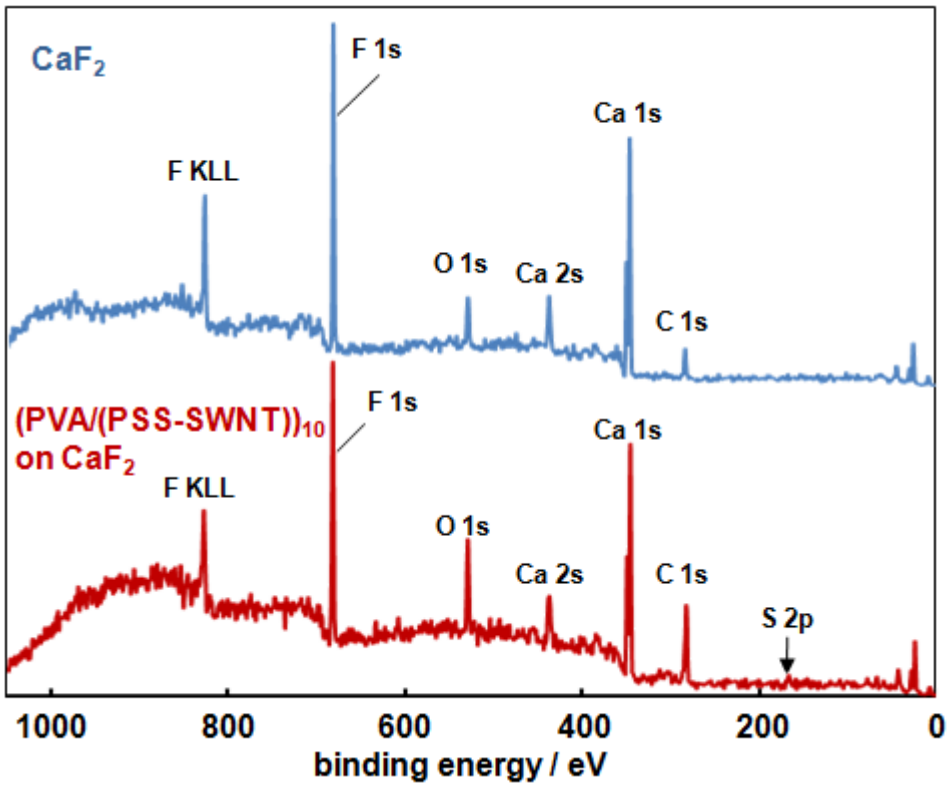

Figure S4. XPS survey spectra of a CaF_2 substrate and a [PVA/(SWNT-PSS)]$_{10}$ LBL film on CaF_2.

A bare CaF_2 substrate was used as a reference. Besides substrate-related signals (F KLL, F 1s, Ca 2s, Ca 1s; see Figure S4, top), C1s and O 1s signals were observed (Figure S4, top), which originate from contamination of sample under normal ambient condition. In addition to those peaks, an S 2p signal was observed at 169 eV derived from PSS wrapping SWNTs for [PVA/(SWNT-PSS)]$_{10}$ sample (Figure S4, bottom). Both spectra for CaF_2 and LBL film showed similar background at around 400 eV, where N 1s peak should appear, indicating the [PVA/(SWNT-PSS)]$_{10}$ sample is also free from IL-contamination.