Electronic Supplementary Material (ESI) for Biomaterials Science

Supporting Documents

Covalent Attachment of Multilayers (CAM); a Platform for pH Switchable Antimicrobial and Anticoagulant Polymeric Surfaces

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In an effort to determine the effect of attached polyelectrolyte tethers on polymeric surface hydrophobicity, contact angles were determined using a sessile drop method measured with a contact angle goniometer. Figure S-1 shows contact angle measurements of poly(tetrafluoroethylene) (PTFE) and ultra-high molecular weight polyethylene (PE) substrates before and after the attachment of maleic anhydride (MA) and polyelectrolytes poly-2-vinylpyridine (P2VP) and poly-*t*-butylacrylate (P*t*BA) at pH 2, 4.9, and 10. As seen, contact angles significantly decrease with the attachment of MA and subsequent attachment of polyelectrolyte tethers, indicating that inherently hydrophobic substrates become hydrophilic.

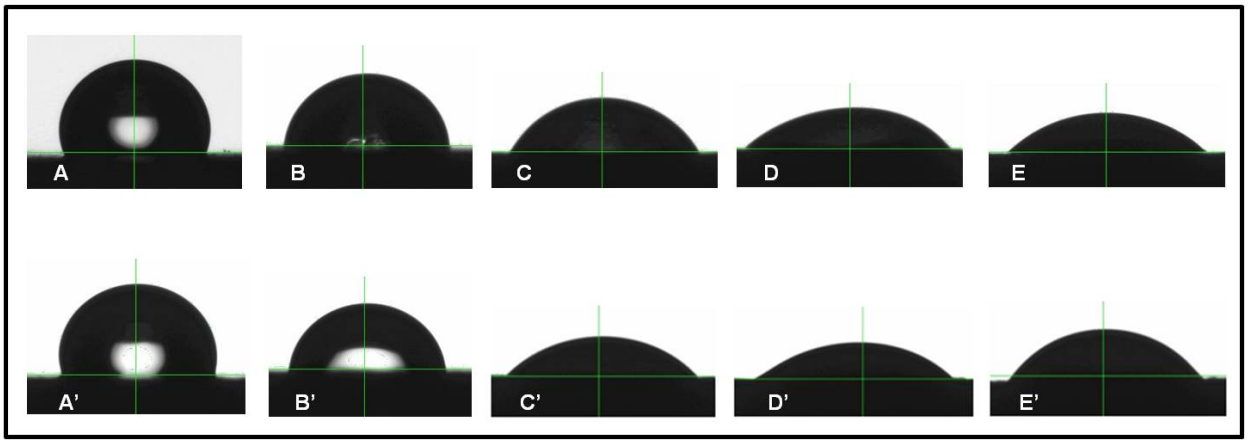

Figure S-1. Images of water droplets on A: PTFE; B: PTFE-MA; C: PTFE-MA-P*t*BA-P2VP at pH 2; D: PTFE-MA-P*t*BA-P2VP at pH 4.9; E: PTFE-MA-P*t*BA-P2VP at pH 10; A': PE; B': PE-MA; C': PE-MA-P*t*BA-P2VP at pH 2; D': PE-MA-P*t*BA-P2VP at pH 4.9; E': PE-MA-P*t*BA-P2VP at pH 10.

Images A and A' of Figure S-1 show water droplets from which contact angles are measured on PTFE and PE substrates, respectively. Images B and B' show water droplets on MA attached PTFE and PE substrates, and C, C', D, D', and E, E' are images of water droplets on P*t*BA and P2VP polyelectrolyte tethered substrates at ph 2, 4.9, and 10, respectively. Figure S-2 illustrates the plotted contact angles on the respected neat and modified polymeric substrates of Figure S-1.

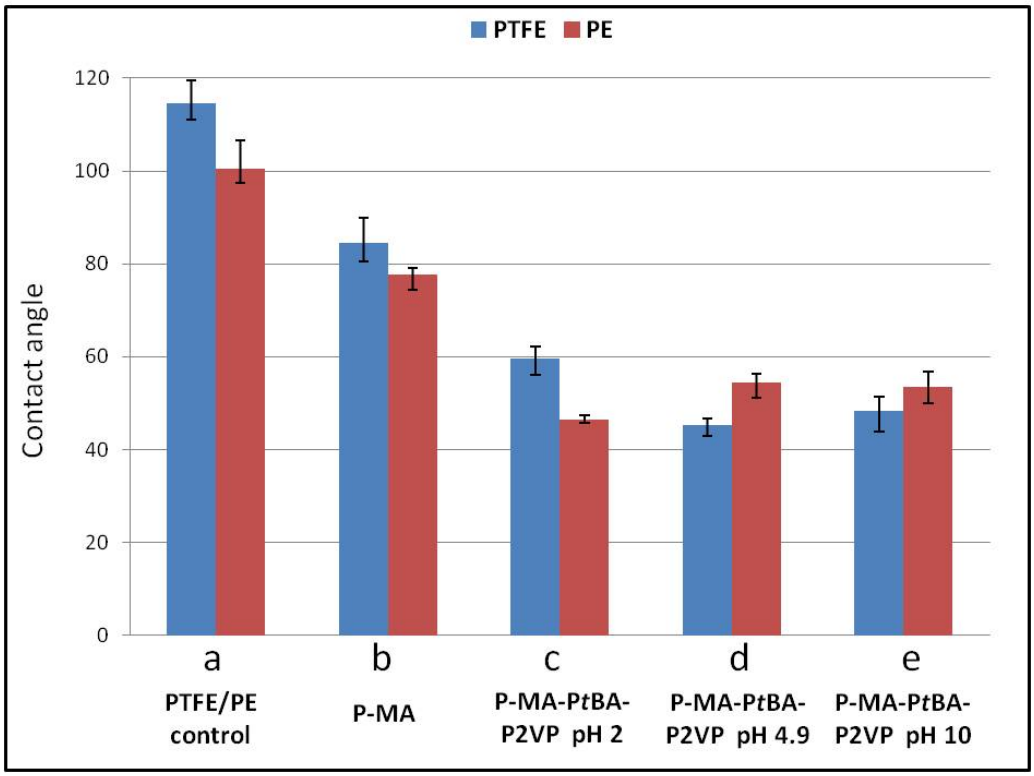

Figure S-2. Contact angle measurements of: a: PTFE and PE; b: PTFE/PE-MA; c: PTFE/PE-MA-P*t*BA-P2VP at pH 2; d: PTFE/PE-MA-P*t*BA-P2VP at pH 4.9; e: PTFE/PE-MA-P*t*BA-P2VP at pH 10.

In order to determine Raman band necessary for determining practical Raman images of coagulated blood on functionalized PTFE and PE substrates, Raman spectra were collected for the polymer surfaces with and without attached polyelectrolyte tethers, as well as for a blood reference. Raman spectra are shown in Figure S-3, in which Trace A corresponds to dried blood and Trace B represents PE substrates with covalently attached P2VP and heparin (HP). Traces C and D illustrate Raman spectra of PE and PTFE substrates, respectively. The band at 1620 cm^{-1} in the blood reference spectrum was chosen as the band to tune to for Raman Imaging analysis due to the lack of overlap of bands for the surface chemistries present in Traces B-D.

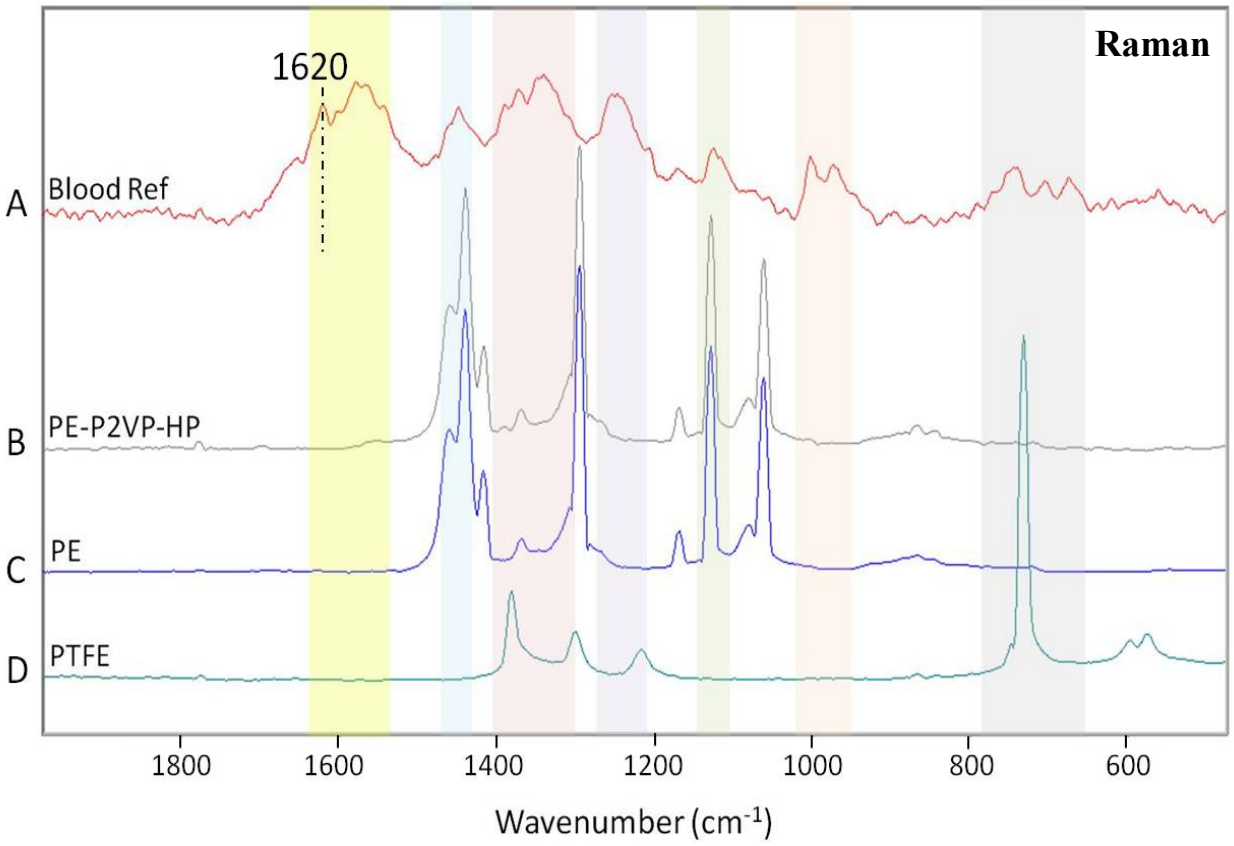

Figure S-3. Raman spectra 2000-500 cm^{-1} region for A: Blood reference; B: PE-P2VP-HP; C: PE and D: PTFE.