

Supporting Information for

**Synthesis of Poly(hydroxyurethane)s from Di(trimethylolpropane)
and Their Application to
Quaternary Ammonium Chloride-functionalized Films**

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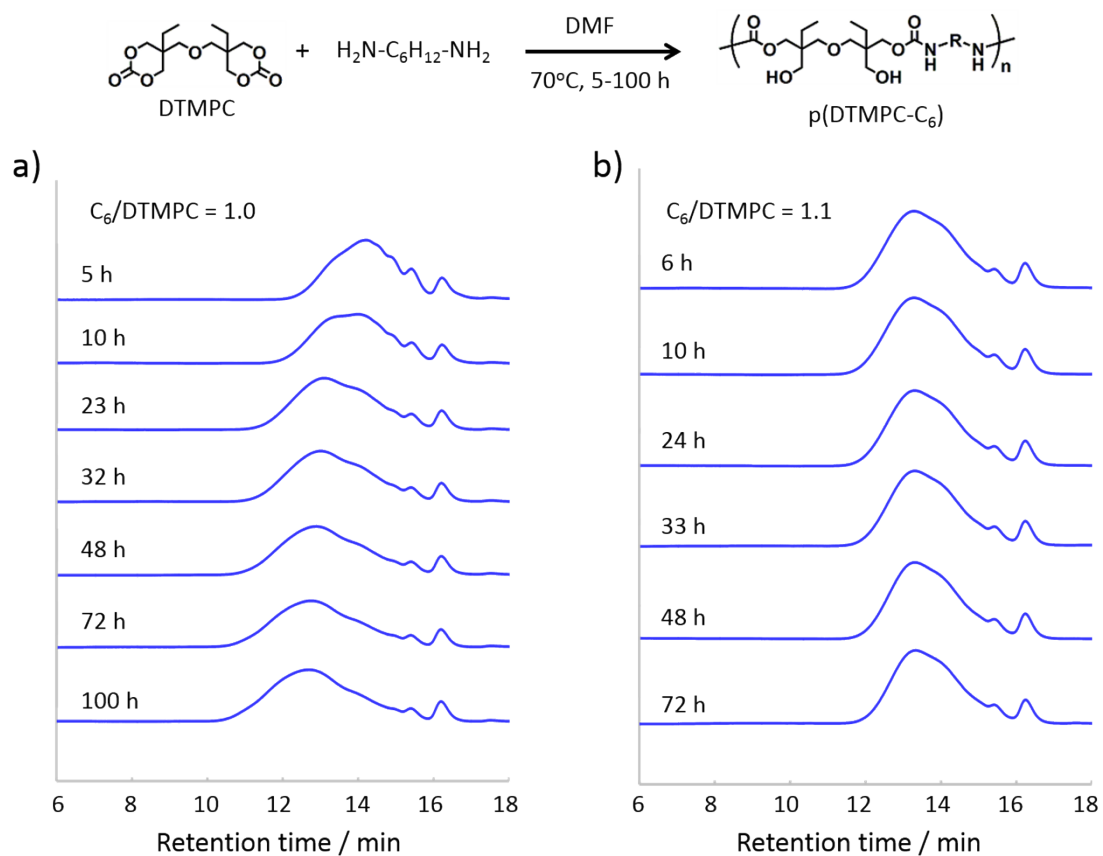


Figure S1 SEC traces of p(DTMPC- C_6) prepared by the polyaddition of di(trimethylolpropane) (DTMPC) and 1,6-diaminohexane (C_6) in DMF at 70 °C with different $C_6/DTMPC$ ratios. The $C_6/DTMPC$ feed ratios are a) 1.0 or b) 1.1. The reaction time is depicted in the figure.

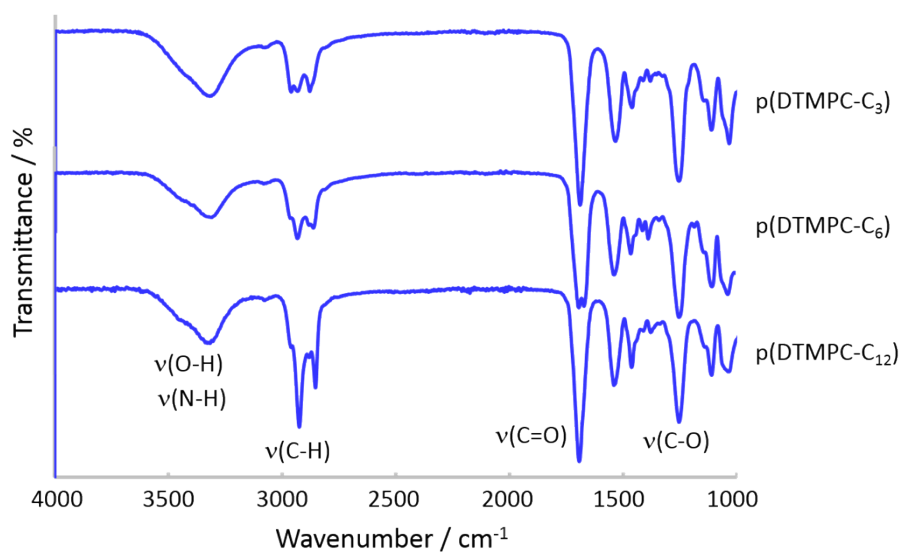


Figure S2 FT-IR spectra of PHUs (p(DTMPC-C_n)) synthesized from DTMPC and diamines with different methylene spaces.

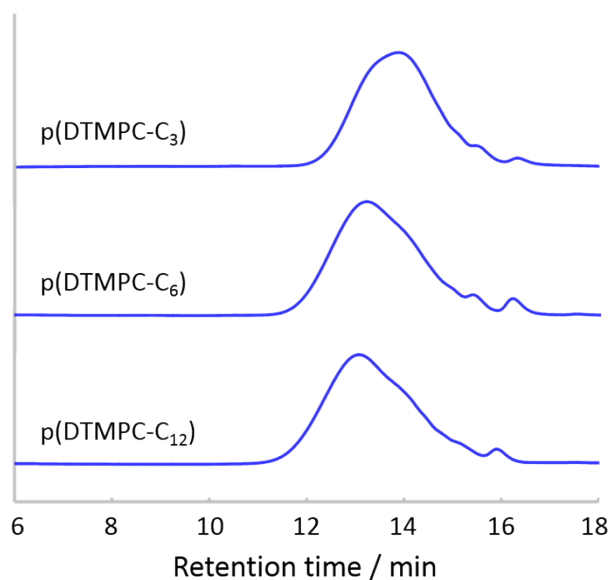


Figure S3 SEC traces of PHUs (p(DTMPC-C_n)) synthesized from DTMPC and diamines with different methylene spaces in DMF at 70 °C for 23 h.

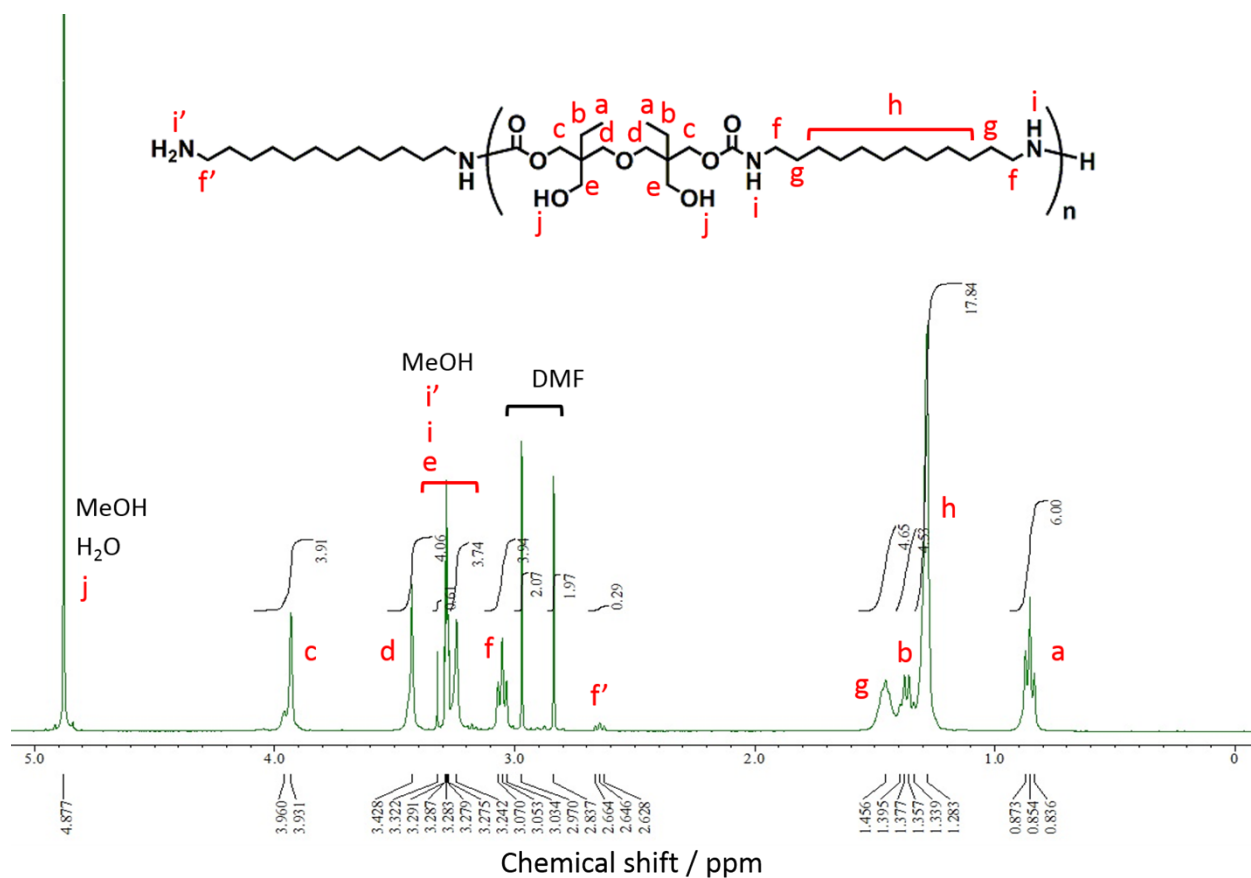
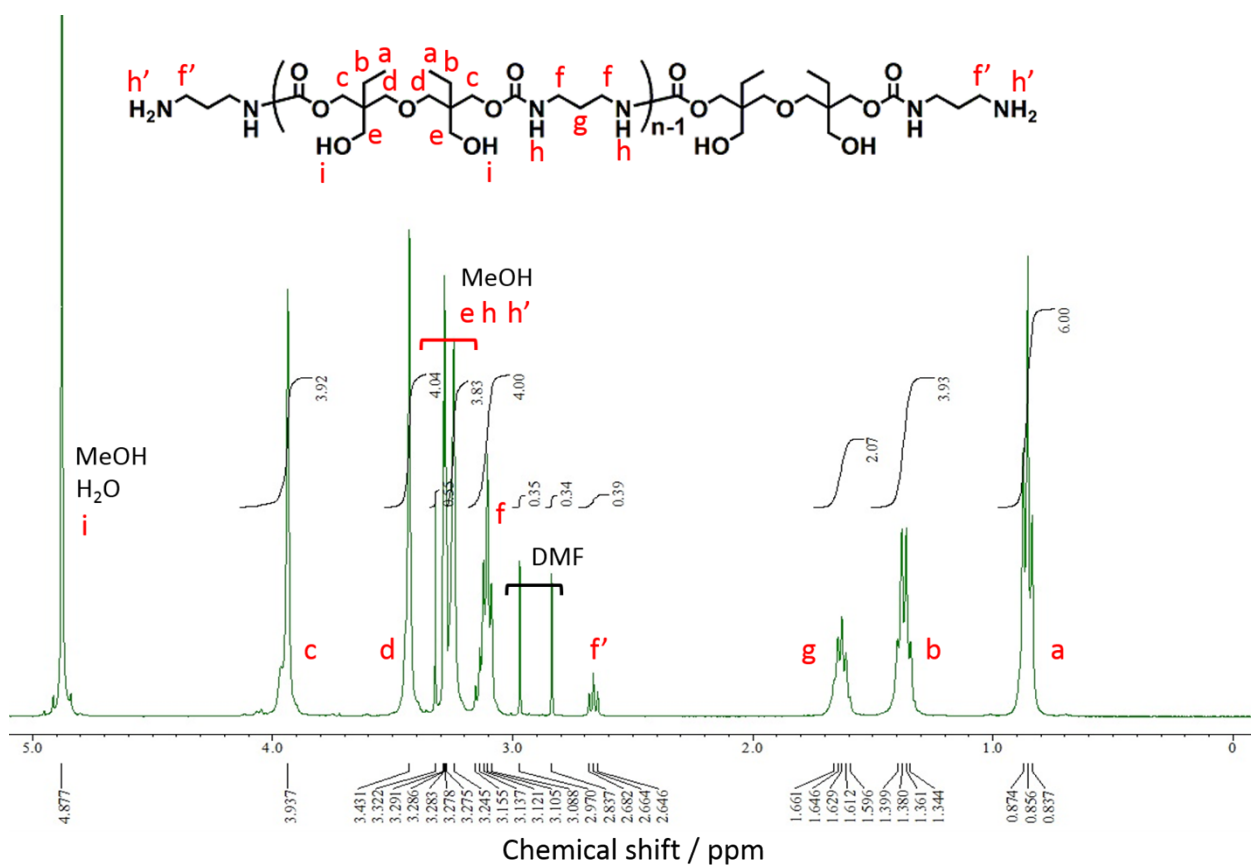


Figure S4 ¹H NMR spectra of p(DTMPC-C_n) in CD₃OD. Top: p(DTMPC-C₃). Bottom: p(DTMPC-C₁₂). The PHUs were synthesized from DTMPC and corresponding diamines with different methylene spaces in DMF at 70 °C for 23 h. The attribution of each signal is depicted in the figures.

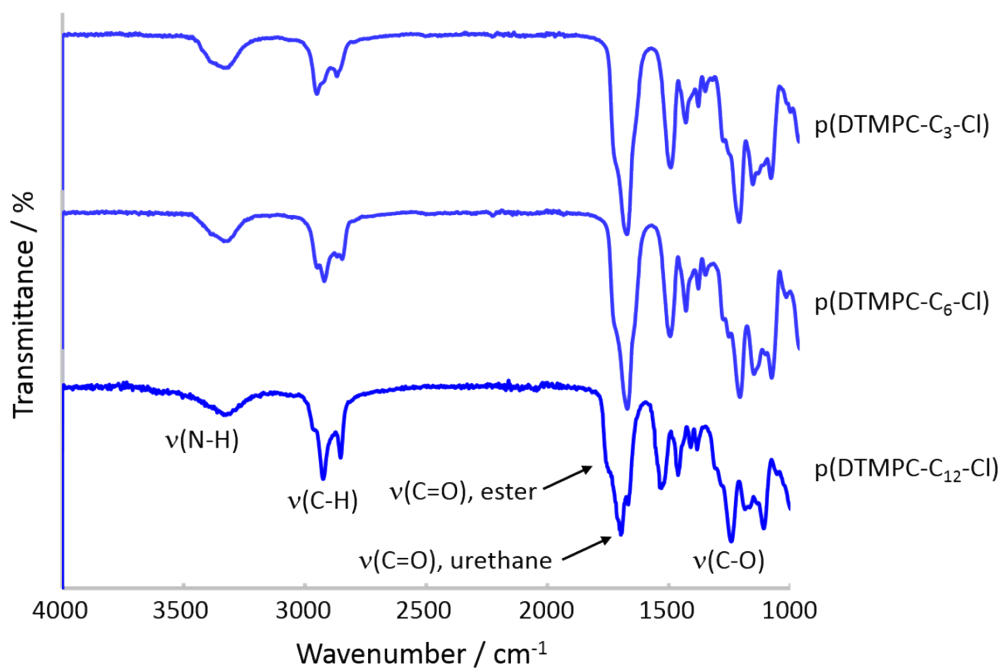


Figure S5 FT-IR spectra of chloroacetylated PHUs (p(DTMPC-C_n-Cl)) PHUs were synthesized from DTMPC and diamines with different methylene spaces and subsequently acetylated.

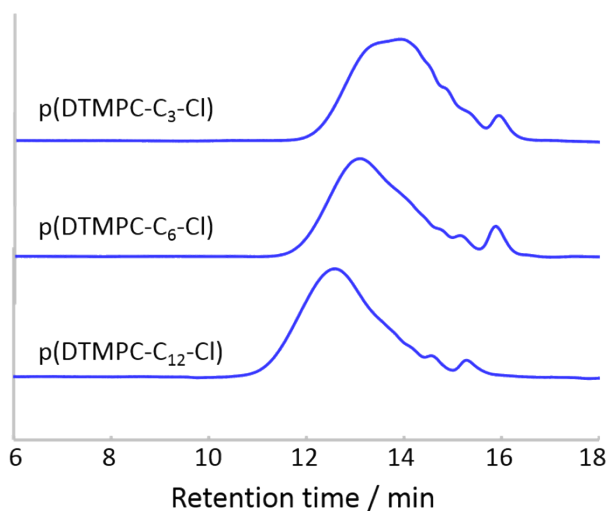


Figure S6 FT-IR spectra of chloroacetylated PHUs (p(DTMPC-C_n-Cl)) PHUs were synthesized from DTMPC and diamines with different methylene spaces and subsequently acetylated.

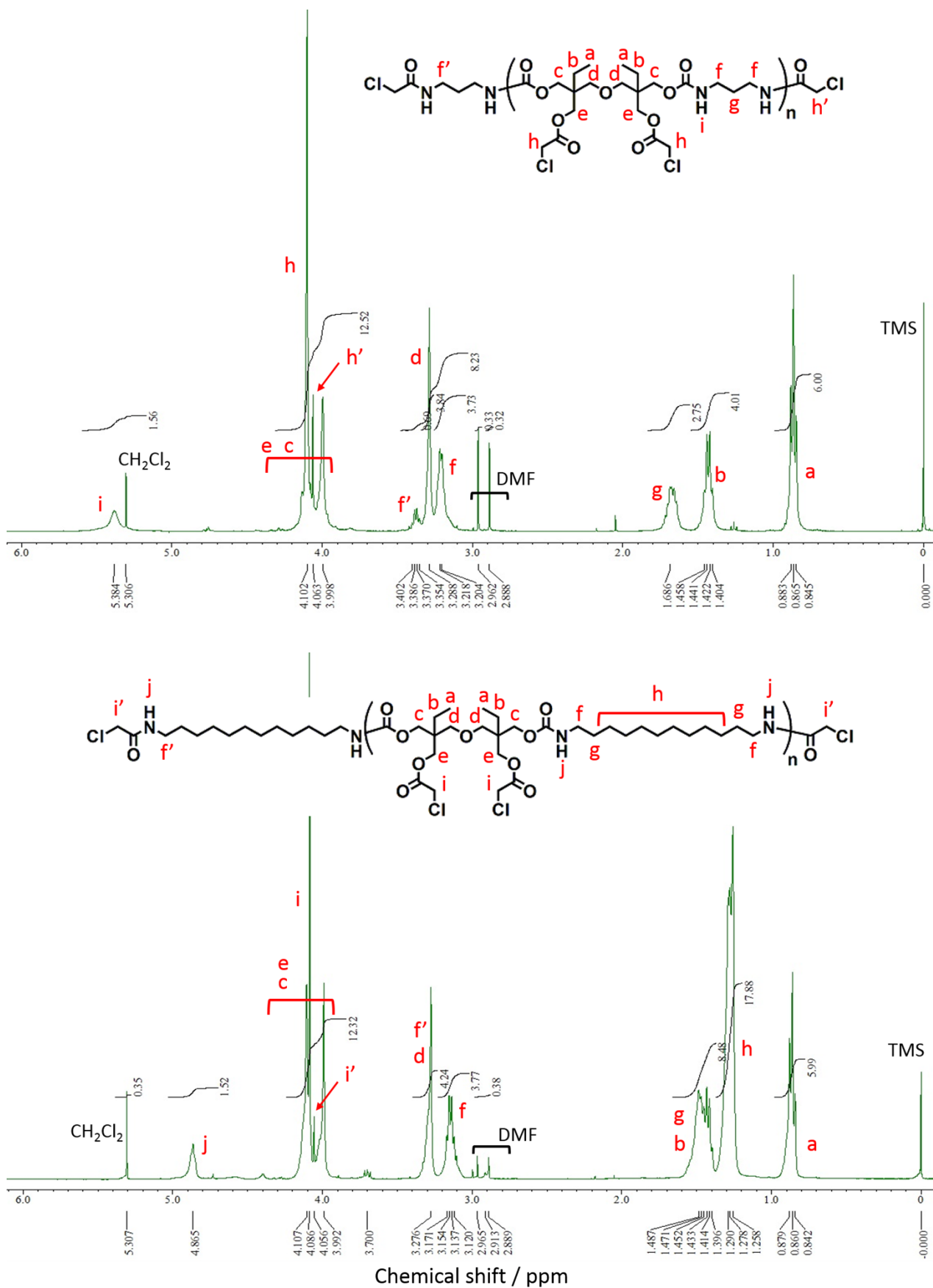


Figure S7 ^1H NMR spectra of acetylated PHUs ($p(\text{DTMPC-}\text{C}_n\text{-Cl})$) in CDCl_3 . Top: $p(\text{DTMPC-}\text{C}_3\text{-Cl})$. Bottom: $p(\text{DTMPC-}\text{C}_{12}\text{-Cl})$. The PHUs were synthesized from DTMPC and corresponding diamines with different methylene spaces and acetylated. The attribution of each signal is depicted in the figures.

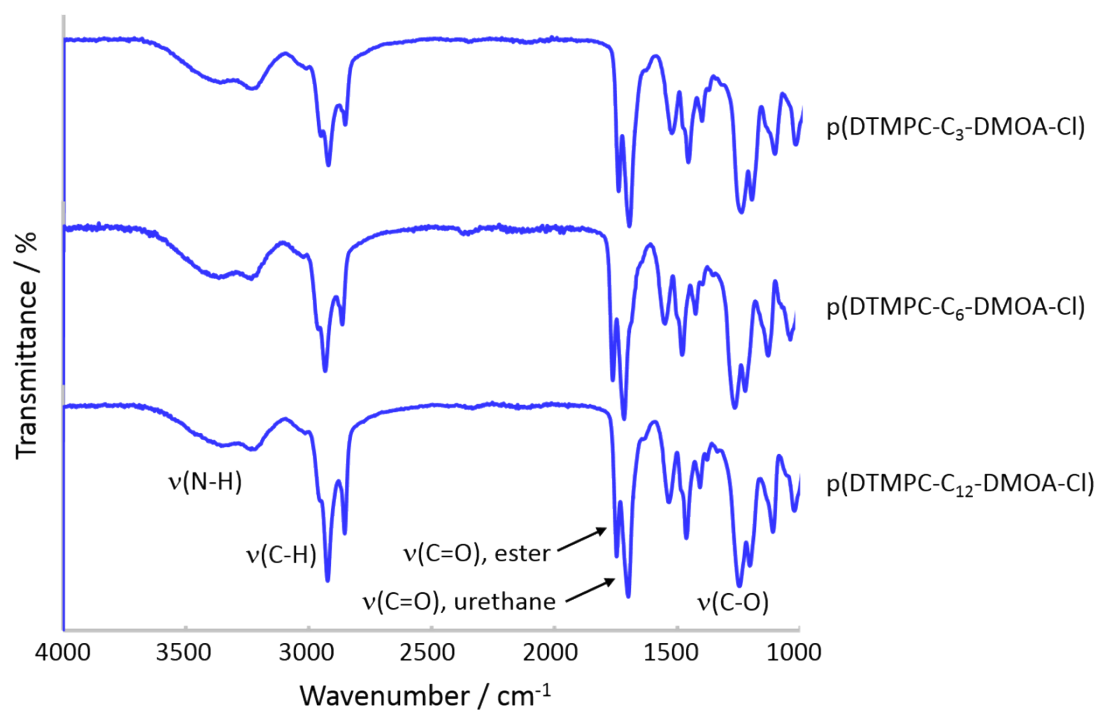


Figure S8 FT-IR spectra of QAC-functionalized PHUs (p(DTMPC-C_n-DMOA-Cl)). PHUs were synthesized from DTMPC and diamines with different methylene spaces and subsequently acetylated followed by quaternized with DMOA.

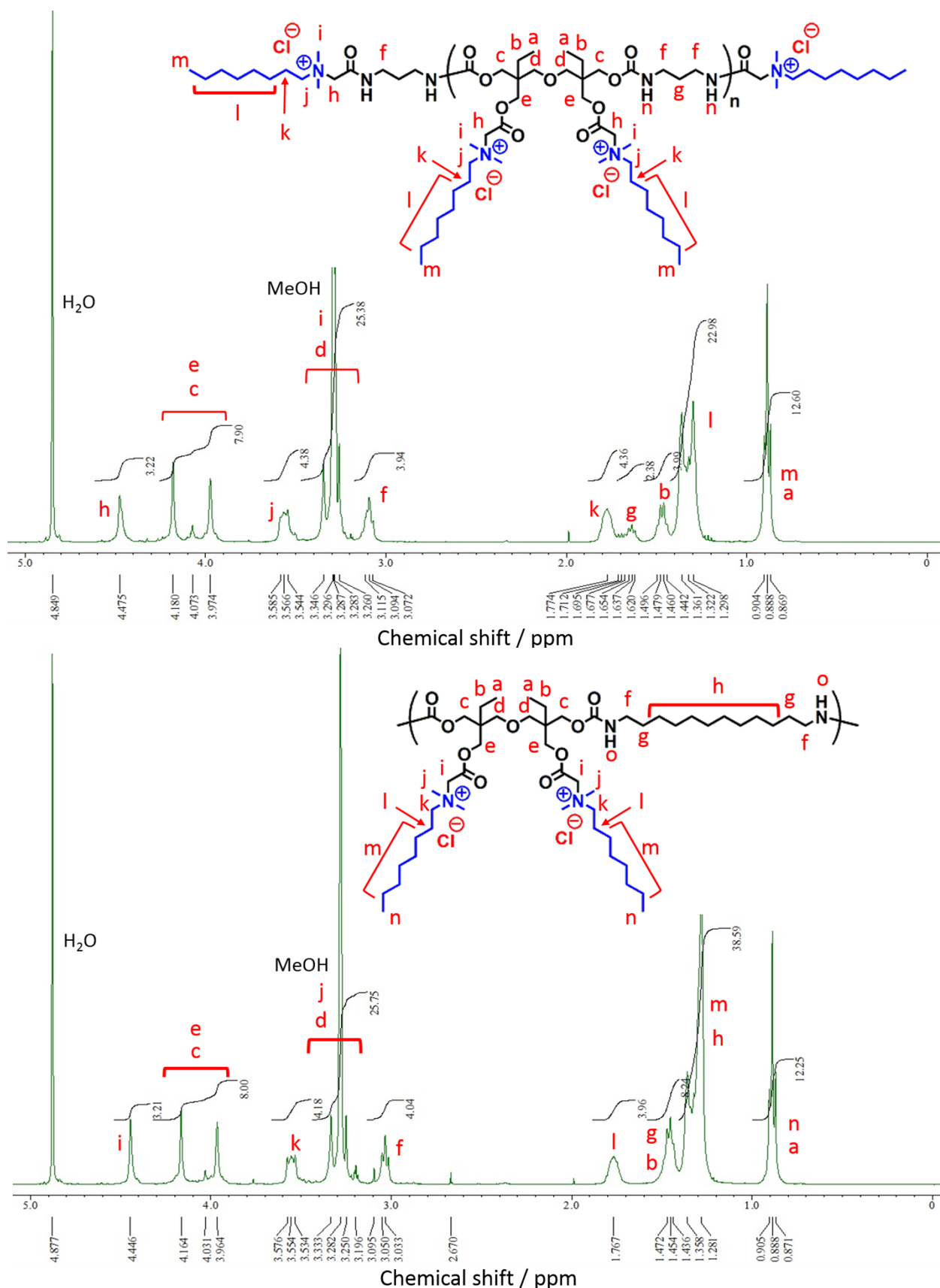


Figure S9 ^1H NMR spectra of QAC-functionalized PHUs ($p(\text{DTMPC-C}_n\text{-DMOA-Cl})$) in CD_3OD . Top: $p(\text{DTMPC-C}_3\text{-DMOA-Cl})$. Bottom: $p(\text{DTMPC-C}_{12}\text{-DMOA-Cl})$. The PHUs were synthesized from DTMPC and corresponding diamines with different methylene spaces and acetylated. The attribution of each signal is depicted in the figures. For $p(\text{DTMPC-C}_{12}\text{-DMOA-Cl})$, the attribution of the both chain ends is omitted for clarity.

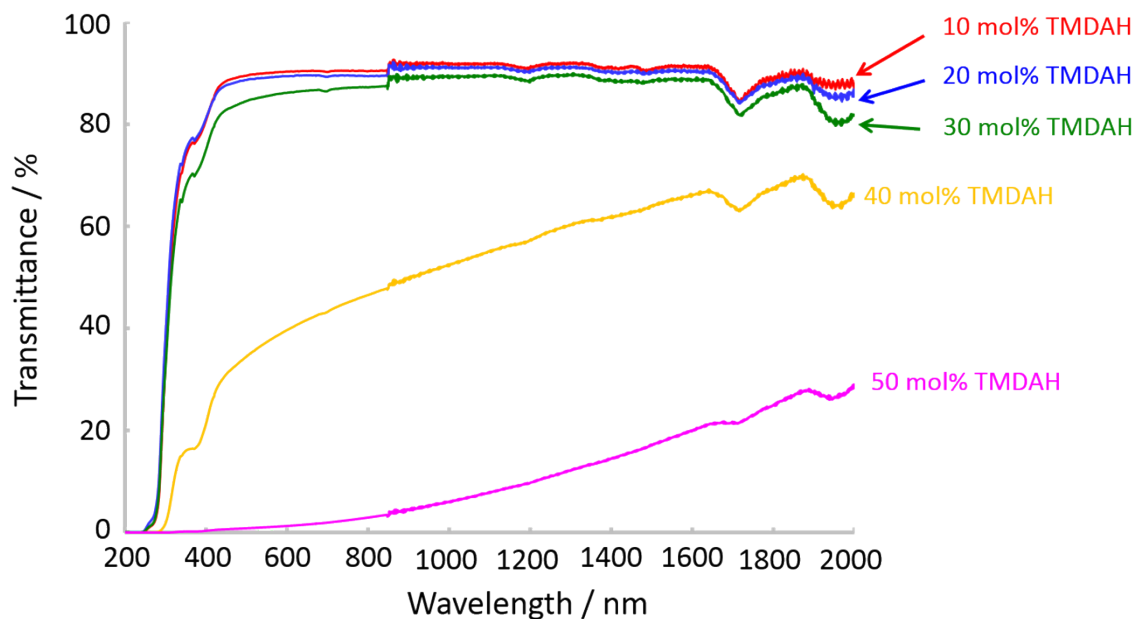


Figure S10 Absorption spectra of QAC-functionalized PHU films (QAC-Films) prepared by the reaction of p(DTMPC-C₆-Cl) with different amounts of TMDAH. TMDAH were 10 (red line), 20 (blue line), 30 (green line), 40 (orange line) or 50 mol% (purple line) with respect to chloroacetyl groups of PHU unit. At vertical axis, absorbance was converted to transmittance.

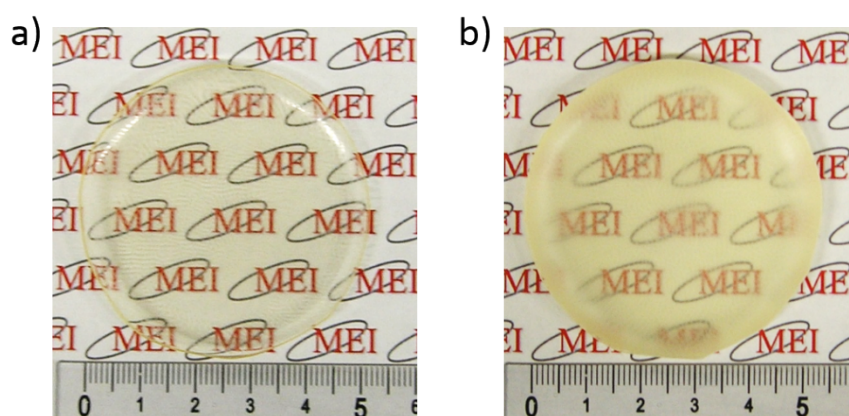


Figure S11 Photographs of QAC-functionalized PHU films (QAC-Films) prepared by the reaction of p(DTMPC-C₆-Cl) with different amounts of TMDAH. TMDAH were a) 40 or b) 50 mol% with respect to chloroacetyl groups of PHU unit.

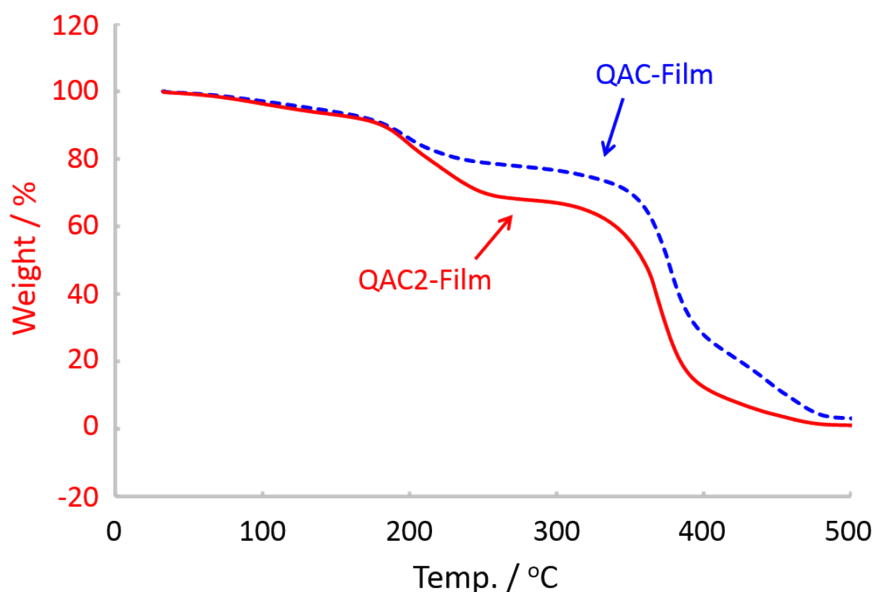


Figure S12 TGA profiles of QAC-Film (blue broken line) or QAC2-Film (red solid line). The QAC-Film was prepared from p(DTMPC-C₆-Cl) with 20 mol% of TMDAH and subsequently modified with DMOA to yield QAC2-Film.

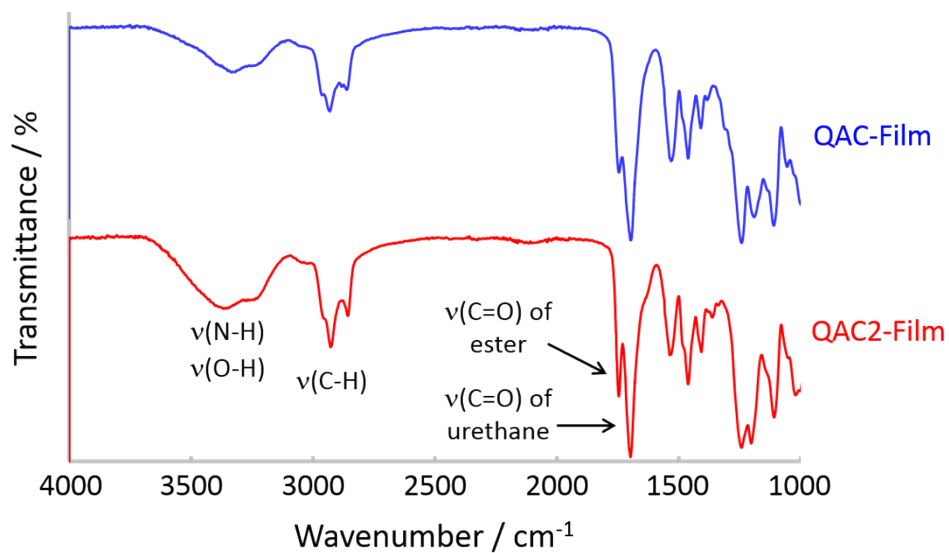


Figure S13 FT-IR spectra of QAC-Film (top) or QAC2-Film (bottom). The QAC-Film was prepared from p(DTMPC-C₆-Cl) with 20 mol% of TMDAH and subsequently modified with DMOA to yield QAC2-Film.