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One-Pot Synthesis of Electro-Active Polymer Gel via Cu(0)-Mediated Radical Polymerization and Click Chemistry

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Figure S1: Evolution of PBIB-P(TMPM$_{23}$-*r*-AzPMA$_2$) polymerisation time before adding end chain PMA with ^{1}H NMR in $CDCl_3$ **(left)** and GPC chromatogram **(right).**

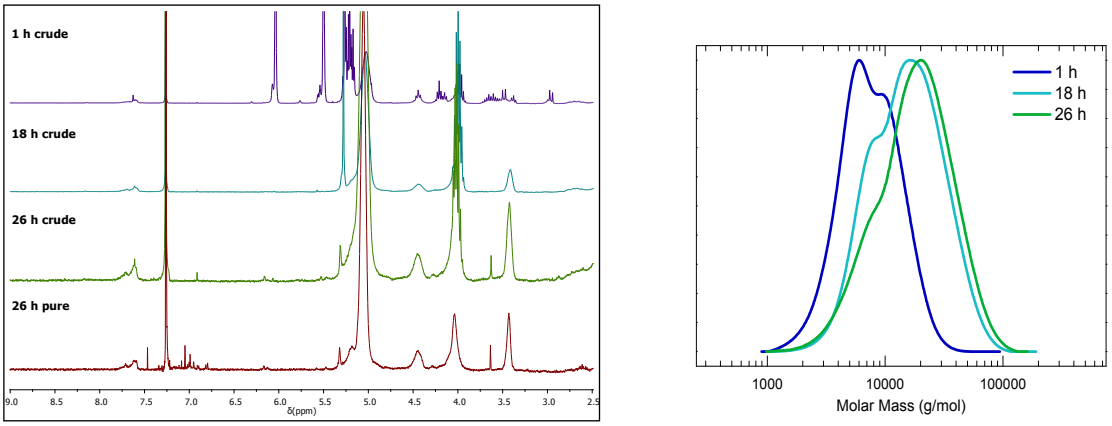


Figure S2: Evolution of PBIB-P(TMPM$_5$-*r*-AzPMA$_2$) polymerisation time before adding PMA with ^{1}H NMR in $CDCl_3$ **(left)** and GPC chromatograms **(right).**

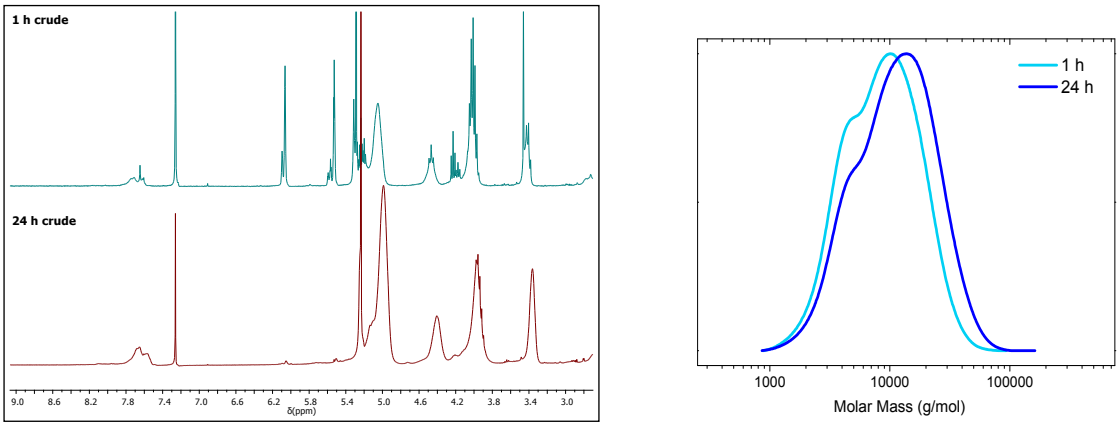


Figure S3: ^{1}H NMR spectrum in $CDCl_3$ **(left)** and GPC chromatogram **(right)** of the crude EBIB-P(TMPM$_{18}$-*r*-AzPMA$_2$) sampled at 1 hour, 3 hours and 9 hours.

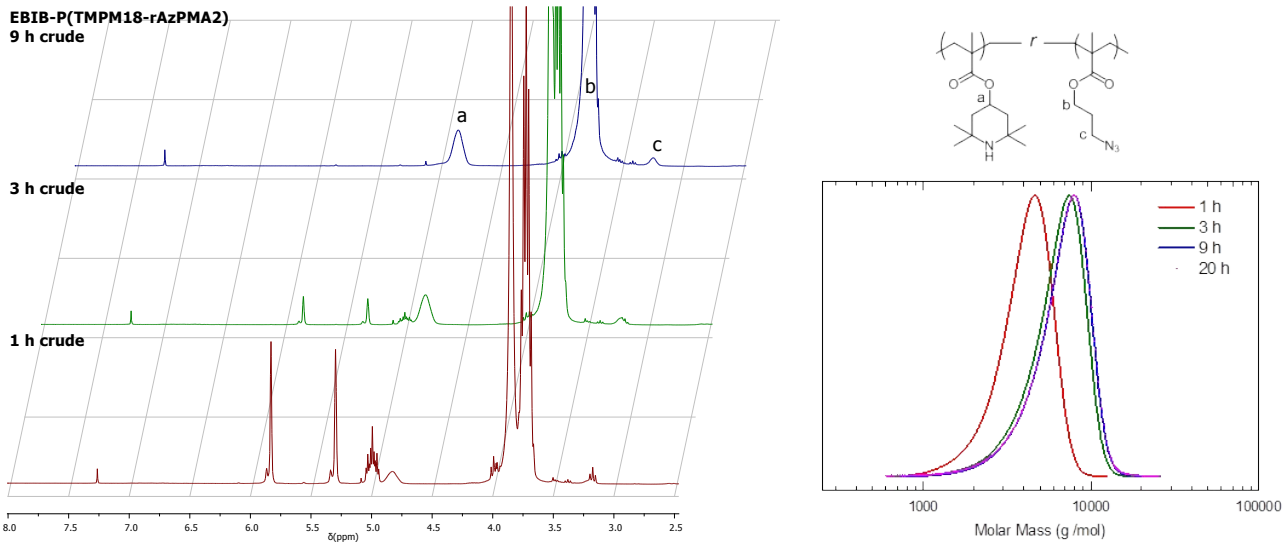


Figure S4: Evolution of the absorbance with time of a solution of CuBr/PMDETA/TMPM/IPA.

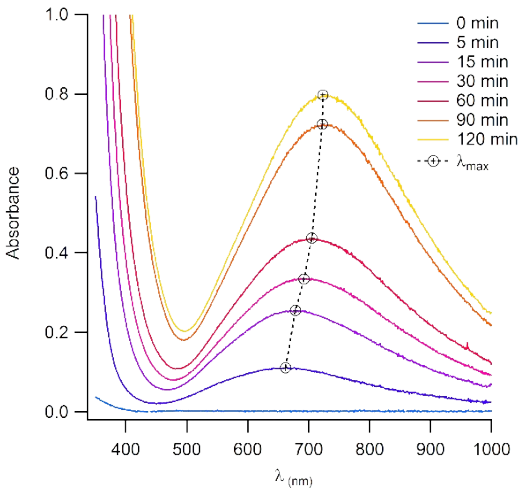


Figure S5: (a) Coloration of solutions of CuBr/PMDETA (left) and Cu(0)/CuBr$_2$/PMDETA (right) in IPA stirred for 5h. **(b)** Overlay of the UV-Vis spectra of a solution of CuBr$_2$/PMDETA (black curve) and a disproportionate solution of CuBr/PMDETA (red curve) in TMPM/IPA.

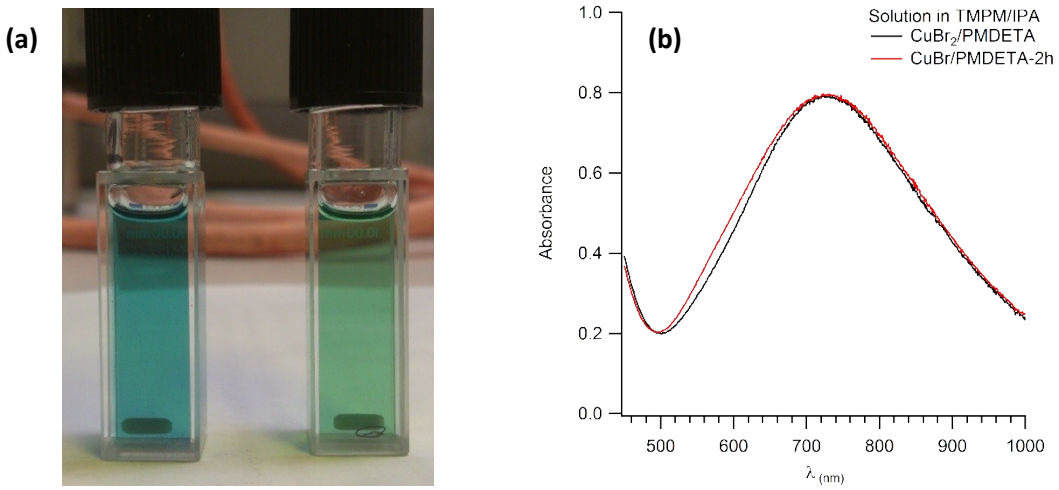


Figure S6: Evolution of the absorbance with time of solution of Cu(0)/$CuBr_2$/PMDETA/TMPM/IPA.

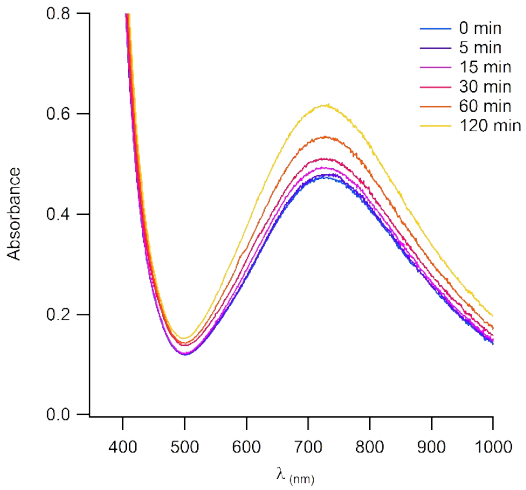
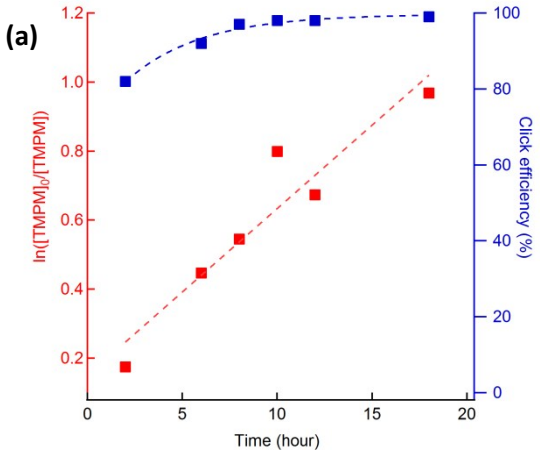
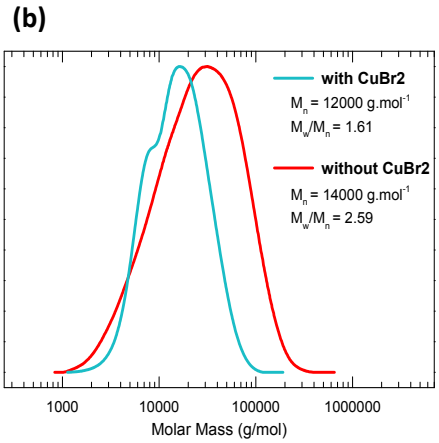


Figure S7: (a) Semi-logarithmic plot of conversion *vs.* time (red) and evolution of the CuAAC efficiency *vs.* time (blue) for the polymerization of Cu°/PBIB/TMPM/AzPMA (5cm/1/23/2) without $CuBr_2$ in the polymerisation medium. (b) ^1H NMR and (c) GPC chromatogram of Cu°/PBIB/TMPM/AzPMA (5cm/1/23/2) at 18 hours of polymerization with $CuBr_2$ (green) and without $CuBr_2$ (red).





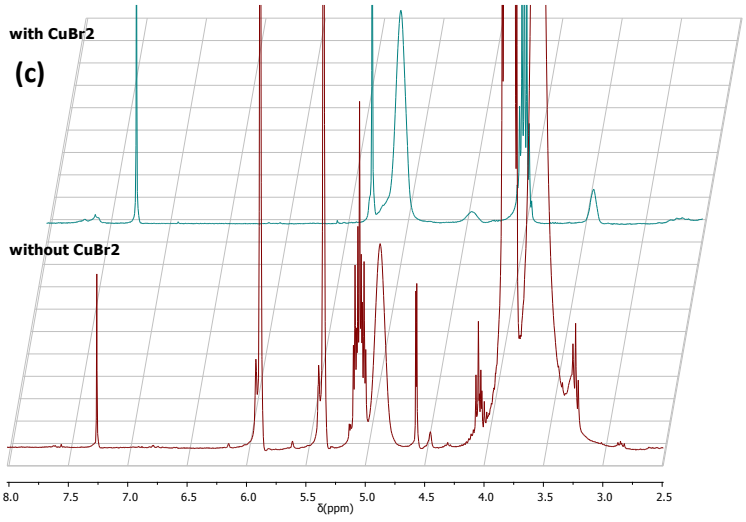


Figure S8: UV-Vis spectrum of PBIB-P(TMPM$_{25}$-*r*-AzPMA$_2$)-PMA (DP25) and PBIB-P(TMPM$_5$-*r*-AzPMA$_2$)-PMA (DP5) oxidized and concentrated to 10 g/L.

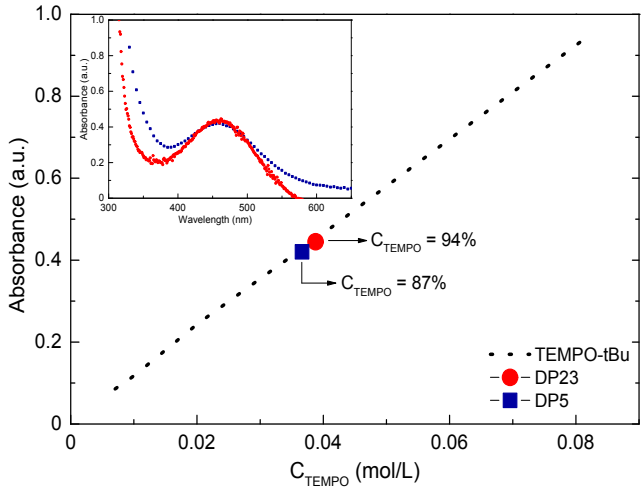


Figure S9: (Top) Charge-discharge performance for PBIB-P(TMPM$_5$-*r*-AzPMA$_2$)-PMA (DP5) **(left)** and PBIB-P(TMPM$_{23}$-*r*-AzPMA$_2$)-PMA (DP23) **(right)** with 30/60/10 of PTMA/SC45/Binder at C/10 and C rate. **(Bottom)** Specific capacity vs cycle number for PBIB-P(TMPM$_5$-*r*-AzPMA$_2$)-PMA (DP5) **(left)** and PBIB-P(TMPM$_{23}$-*r*-AzPMA$_2$)-PMA (DP23) **(right)** electrodes cycled in half-cell configuration with Lithium as counter electrode.

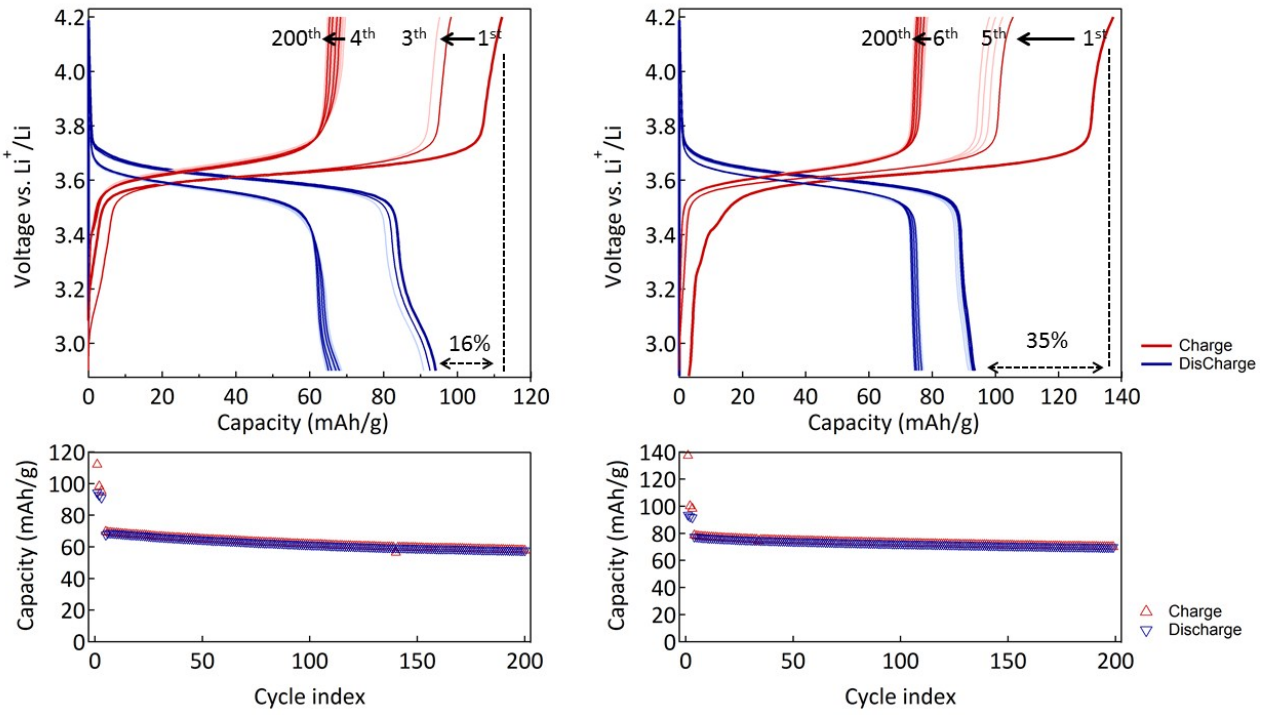
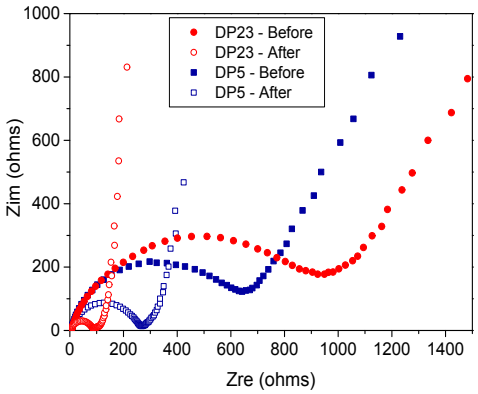
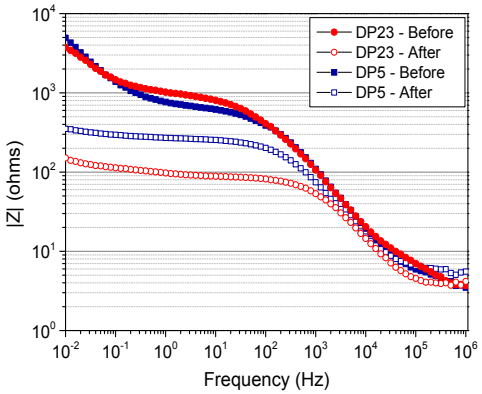


Figure S10: Nyquist plots **(left)** and Bode plots **(right)** by EIS of PBIB-P(TMPM$_5$-*r*-AzPMA$_2$)-PMA (DP5) **(blue)** and PBIB-P(TMPM$_{23}$-*r*-AzPMA$_2$)-PMA (DP23) **(red)** with 30/60/10 of PTMA/SC45/Binder in half-cell, before and after 200 charge-discharge cycles at a rate of 1C, over a frequency range of 1 MHz to 10 mHz.


DP23 - Before
DP23 - After
DP5 - Before
DP5 - After
Zim (ohms)
Zre (ohms)
0
200
400
600
800
1000
1200
1400


DP23 - Before
DP23 - After
DP5 - Before
DP5 - After
|Z| (ohms)
Frequency (Hz)