

Supporting Information

Electrochemical modulation of mechanical properties of glycolated polythiophenes

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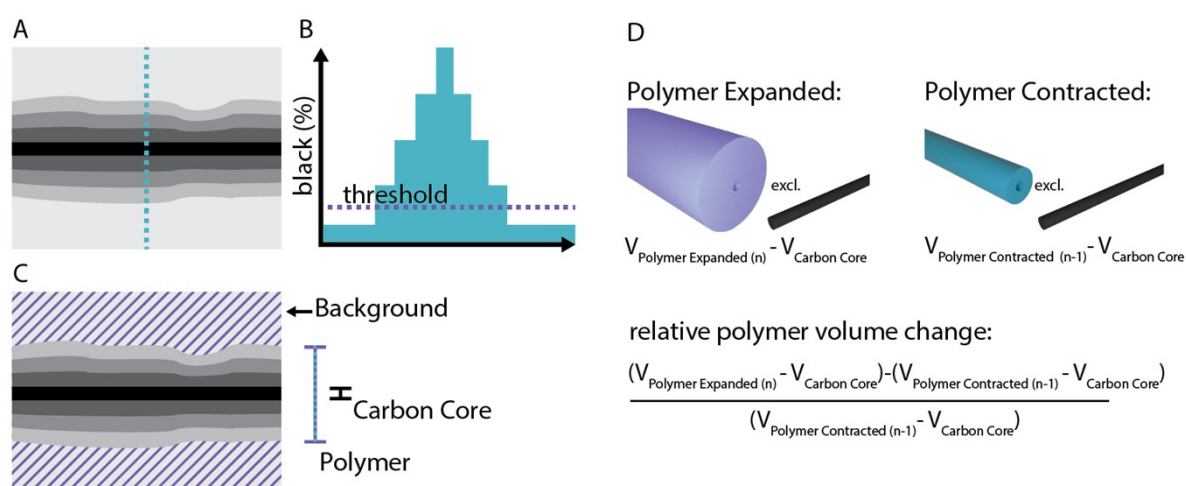


Figure S1 Polymer Feature Extraction Schematic representation of the extraction of the features from the micrographs. **A** Representation of a model micrograph of a coated carbon fiber (black) with expanded polymer (grey bars). **B** Grey value distribution of the model micrograph. **C** Representation of the features in the micrograph and the effect of applying a grey value threshold. **D** Calculation of the relative polymer volume change.

In a first step, the acquired images have been transformed into greyscale images (A). In a greyscale image, each pixel represents a brightness value between 0 (black) and 255 (white) (B). Hence, the micrograph can be considered a 2D matrix of brightness values. In a typical micrograph such as those acquired in the experiments, the background is brighter in contrast to the polymer and carbon fiber features. This allows the extraction of the features of interest with a grey value threshold (i.e. a number between 0 and 255) (C). The extracted features of interest could then be used to calculate the volume of the polymer. Over the entire length of the fiber, the average feature width corresponds to the average diameter of a cylinder representing the polymer volume. Hence, the actual polymer volume equals the feature volume excluding the volume of the carbon fiber in the center. The relative polymer volume change then equals the polymer in expanded state with respect to the polymer in contracted state (D).

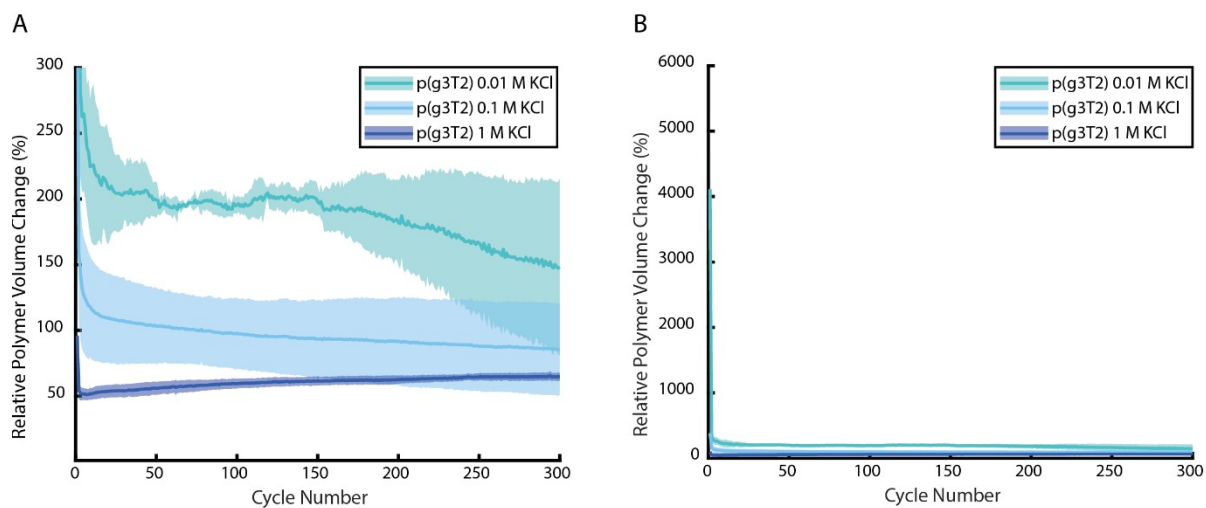


Figure S2 P(g3T2) 300 switching cycles experiments of p(g3T2) in KCl concentrations (0.01 M, 0.1 M, 1 M). **A** Limited y axis to be able to appreciate the propagation over the 300 cycles. **B** Unlimited y axis highlighting the extreme expansion in the first cycle.

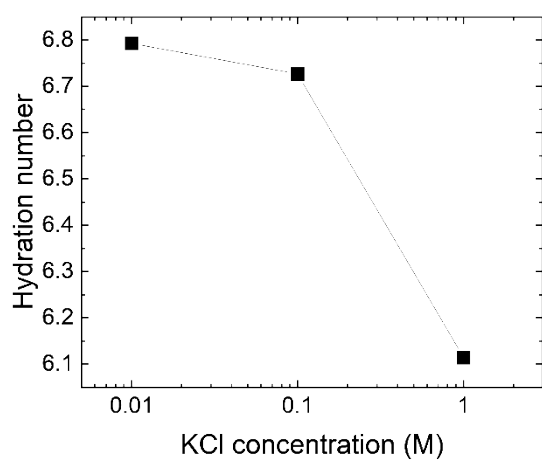


Figure S3 Hydration number of Cl anions for different KCl concentrations.

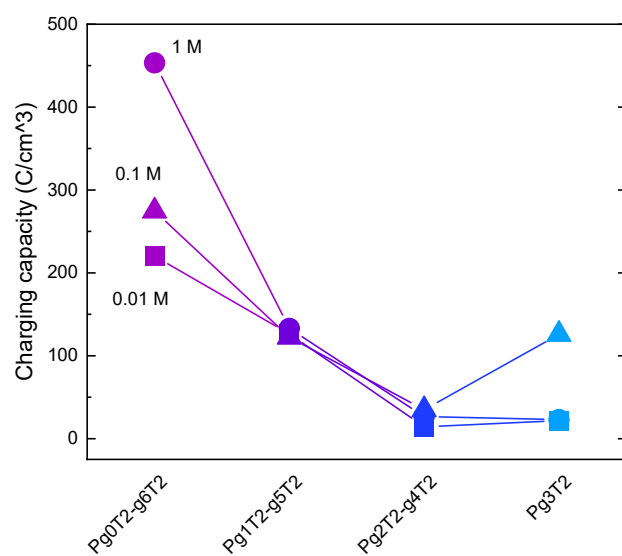


Figure S4 Charging capacity extracted from chronoamperometries for the different polymers at different electrolyte concentrations. To extract this value, we calculated the charges circulating in the circuit by integrating the current vs time.

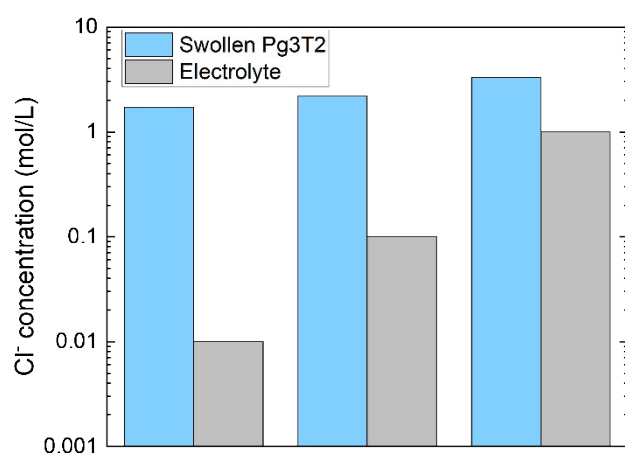
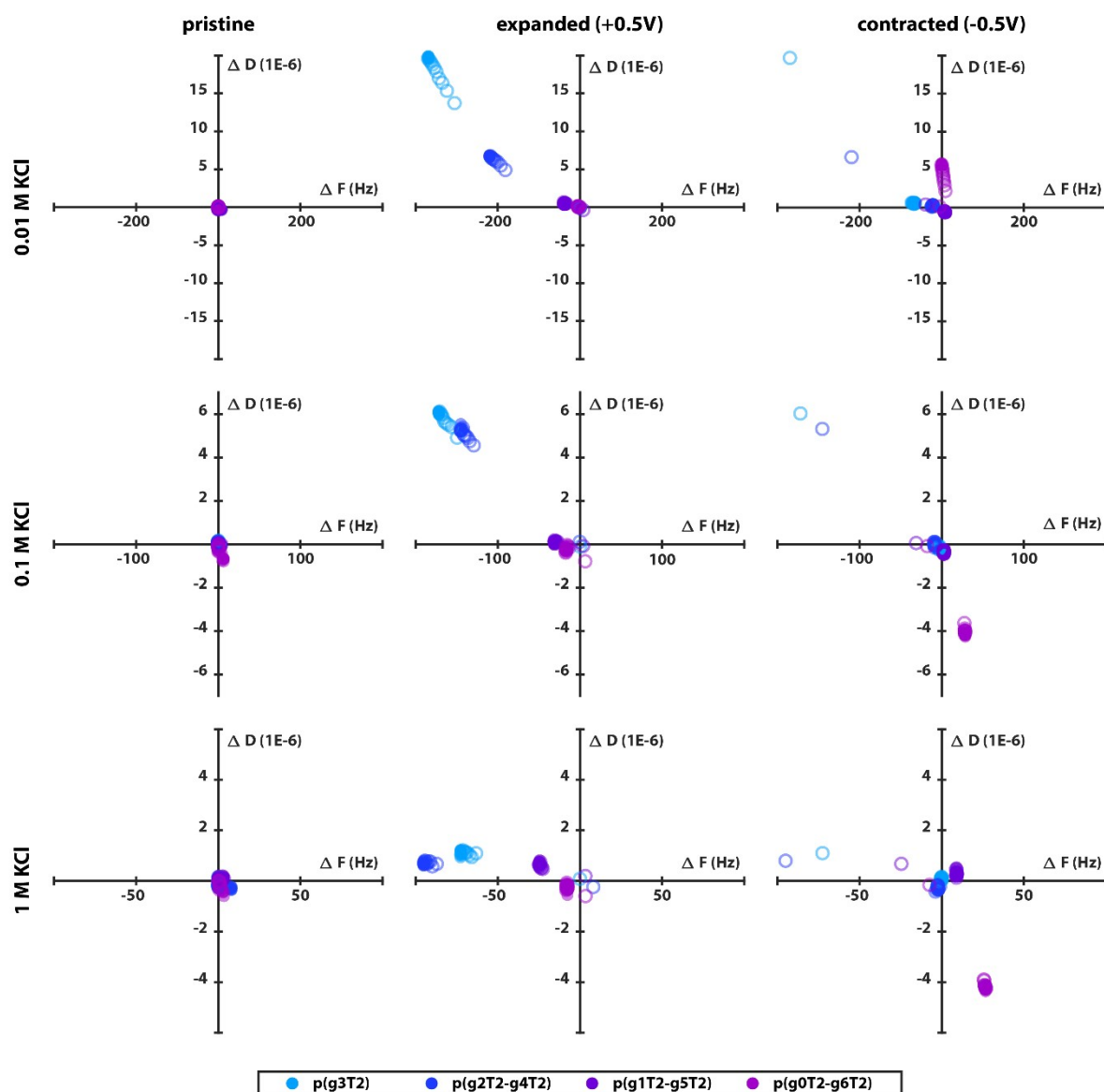


Figure S5 Chloride anions concentration in the swollen polymer compared to the concentration of the electrolyte. The concentration was calculated dividing the number of Chloride anions (extracted from the current) by the final volume reached by the polymer in the different electrolytes.



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figure S6 Overview of the Frequency and Dissipation changes of the different polymers in the different KCl concentrations found in the eQCM-D experiments following the electrochemical stimulation (expansion and contraction).

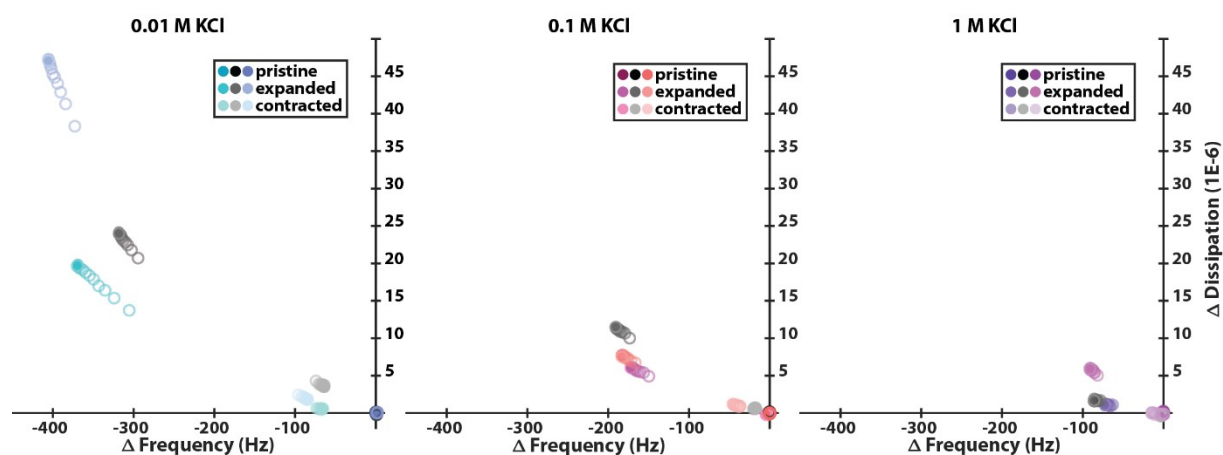


Figure S7 Frequency and Dissipation changes observed for 3 different samples p(g3T2) films in 0.01, 0.1 and 1 M KCl respectively, for pristine, expanded (+0.5 V) and contracted (-0.5 V) state observed in eQCM-D.

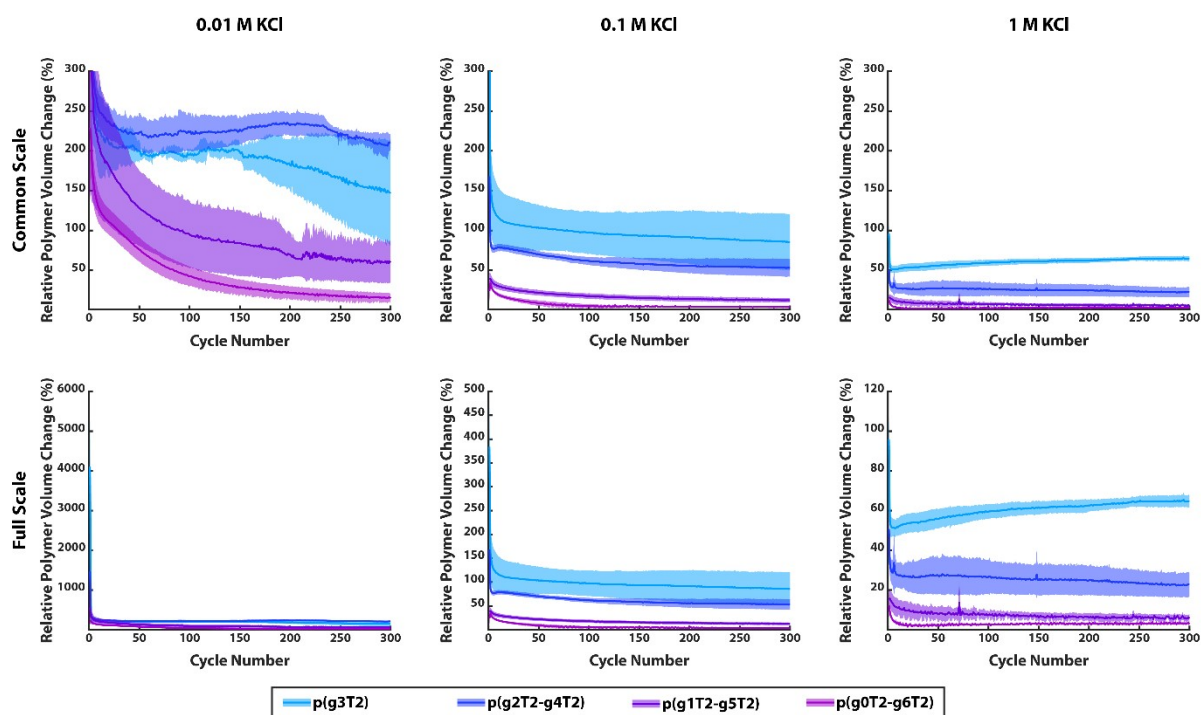


Figure S8 Overview of the 300 switching cycles experiments of the different polymers (p(g3T2), p(g2T2-g4T2), p(g1T2-g5T2), p(g0T2-g6T2)) in the different KCl concentrations (0.01 M, 0.1 M, 1 M). Upper row common scale to enable comparison, bottom row showing also the extreme values in the first cycle.