Electronic Supplementary Material (ESI) for Physical Chemistry Chemical Physics.

Title: Dielectric relaxations of polyether-based polyurethanescontaining ionic liquids as antistatic agents

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I(t) *vs.* t profiles

The *I*(t) *vs.* t curves are obtained (Fig. S1), as reported elsewhere[1] by inverse Fourier transformation of the r.t. complex permittivity in the frequency-domain, $\varepsilon^*(\omega)$, using equation:

$$I(t) = C_0 V_0 \cdot \frac{1}{2\pi} \int_{-\infty}^{+\infty} \varepsilon^*(\omega) e^{i\omega t} d\omega = C_0 V_0 \cdot \mathrm{F}^{-1}\left[\varepsilon^*(\omega)\right] \quad , \quad t > 0 \qquad \textbf{(Eq. S1)}$$

where C_0 is the geometric capacitance of the sample, V_0 is the height of the applied step voltage and $\varepsilon^*(\omega)$ is the complex permittivity given by Eq. 3. in the text. In Fig. S1, the overall *I*(t) profiles of PU and PU-CF samples are compared with the contributions of electrode polarization and dielectric relaxation phenomena.

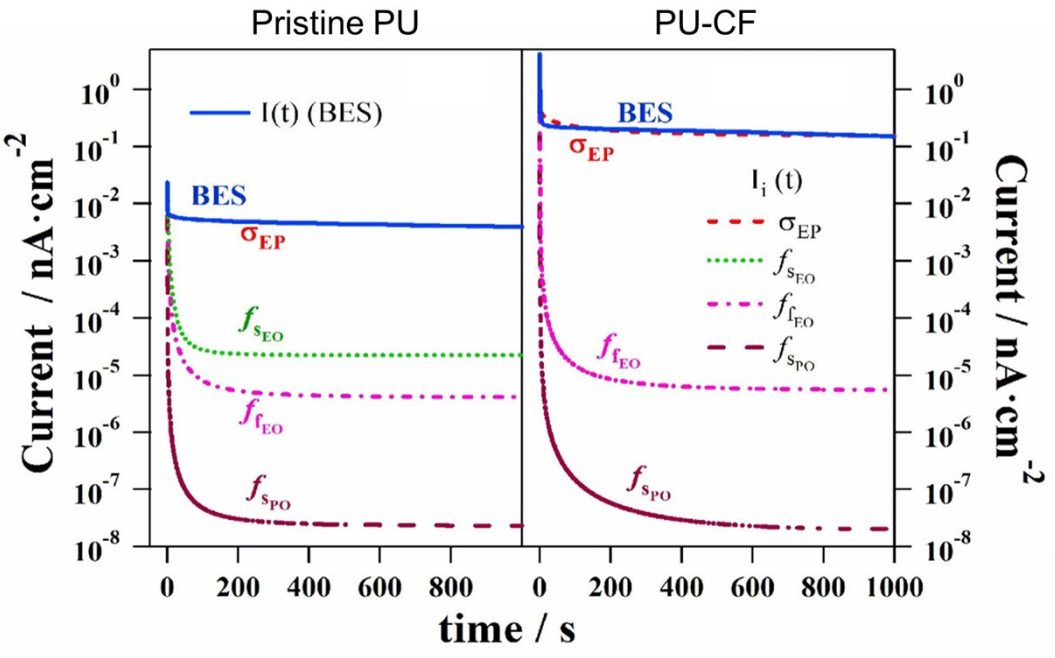

Fig. S1. Dependence on *t* of the profiles of overall *I*(t) (BES measurement), electrode polarization ($I\sigma_{EP}$(t)) and dielectric relaxations (I_i(t), with i = f_{sEO}, f_{fEO} and f_{sPO}) for both PU and PU-CF samples. *I*(t) and I_i(t) are obtained by the inverse Fourier transform (Eq. S1) of the overall r.t. complex permittivity, $\varepsilon^*(\omega)$, (see Eq. 3 in the main text) and of each of its terms corresponding to the detected electric events, respectively.

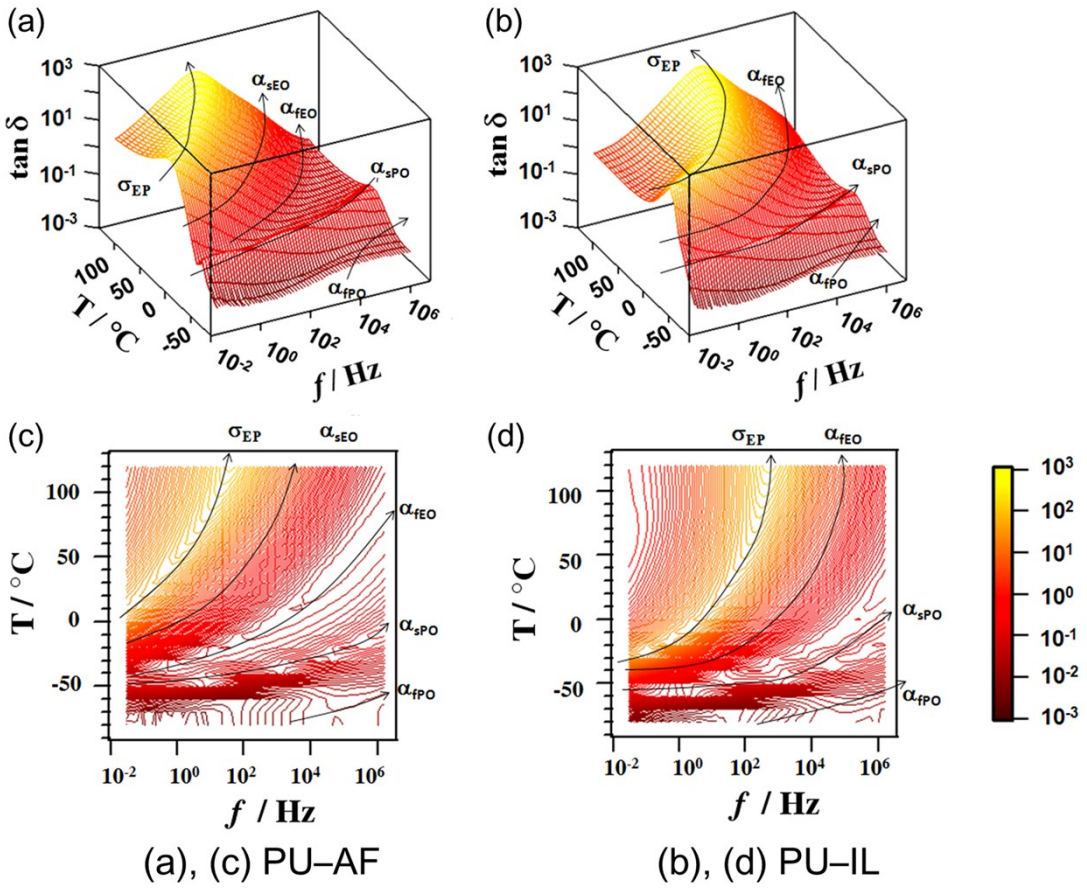

Fig. S2. Tanδ *vs.* temperature and frequency in 3D (a, b) and contour map (c, d).

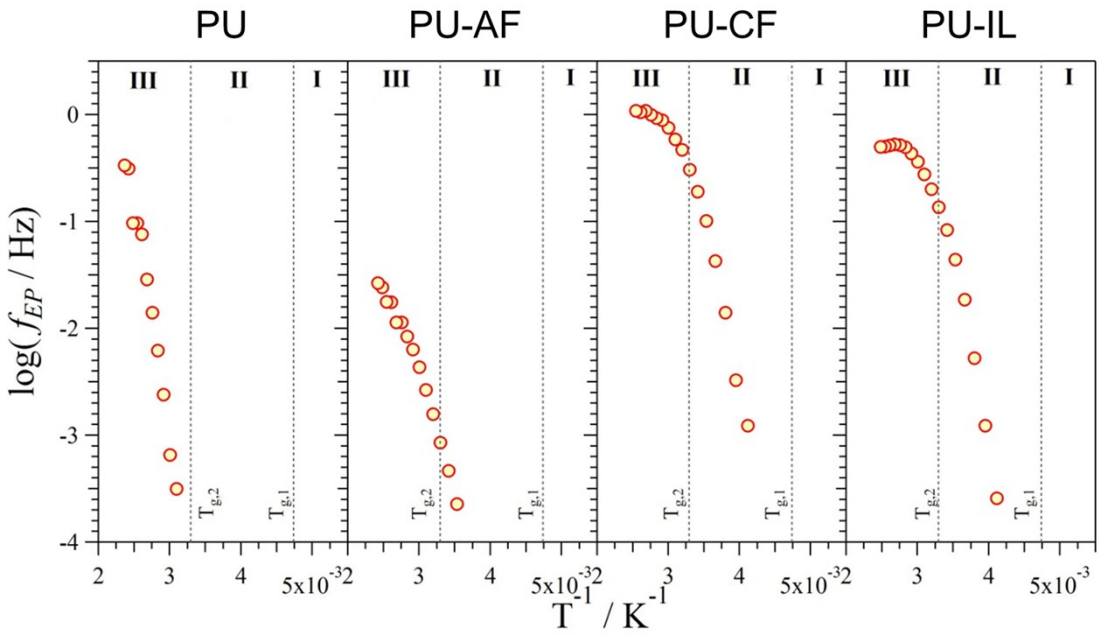

Fig. S3. Dependence of the fitted polarization frequencies (f_{EP}) on temperature in the investigated films. f_{EP} is determined by Eq. 3. in the text.

References

1. A. Schönhals, *Acta Polymerica,* 1991, **42**, 149.