Supplementary Materials

A New Glass-Forming Electrolyte Based on Lithium Glycerolate

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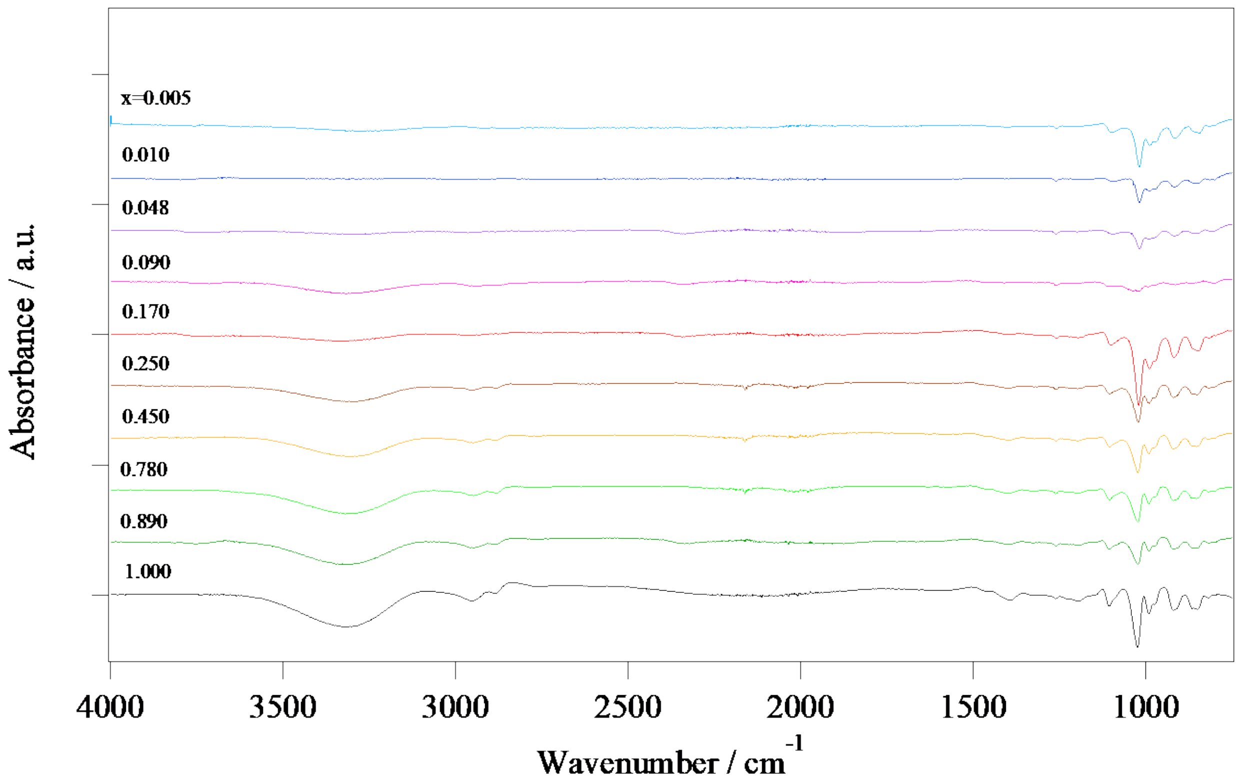


Figure S1. FT-IR differential spectra. Glycerol FT-IR spectrum is subtracted from the spectrum of each $GlyLi_x$ sample.

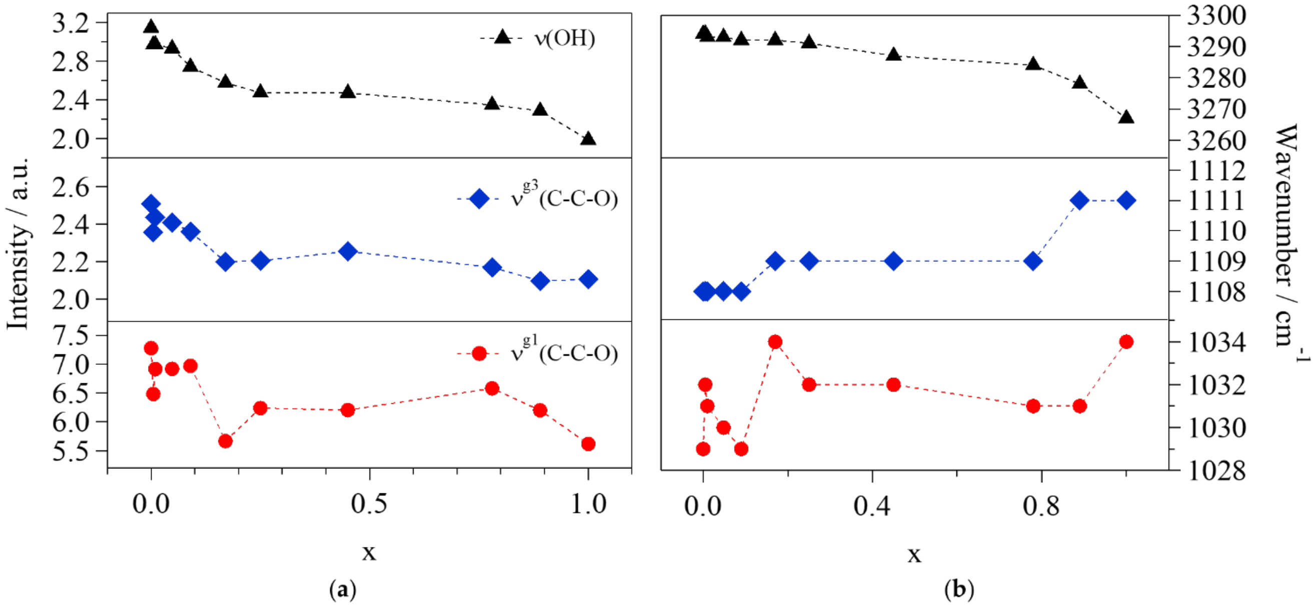


Figure S2. Intensity and wavenumber behavior of ν(OH), ν^{g3}(C-C-O), and ν^{g1}(C-C-O) FT-IR vibrations at different x values.

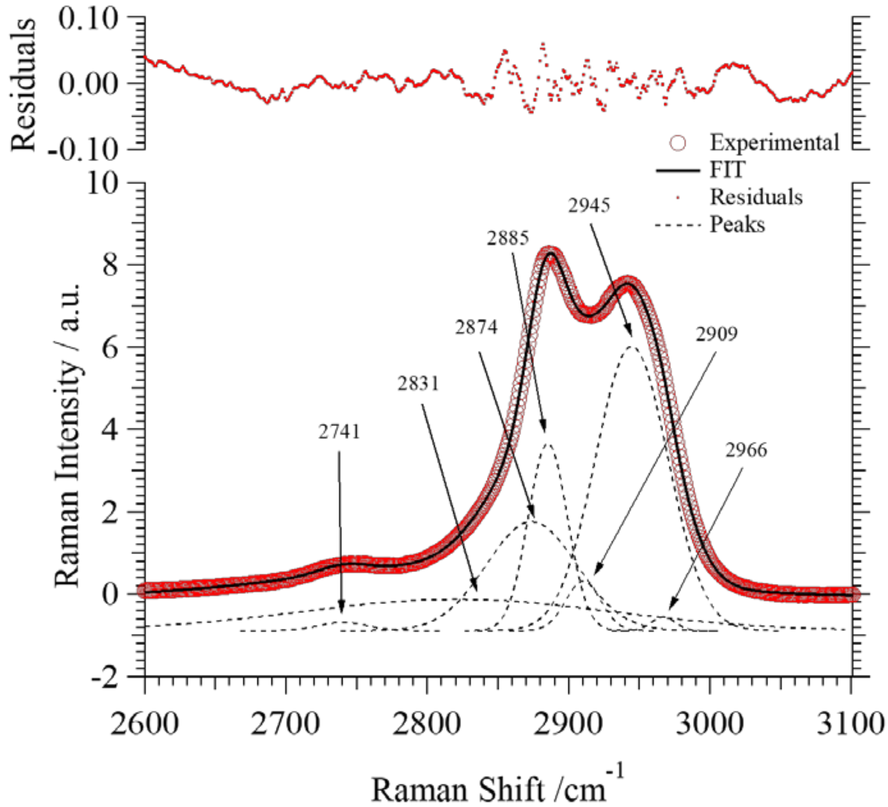


Figure S3. Lorentzian fitting of the micro-Raman spectrum of pristine glycerol (x = 0) in the 2600÷3100 cm^{-1} region.

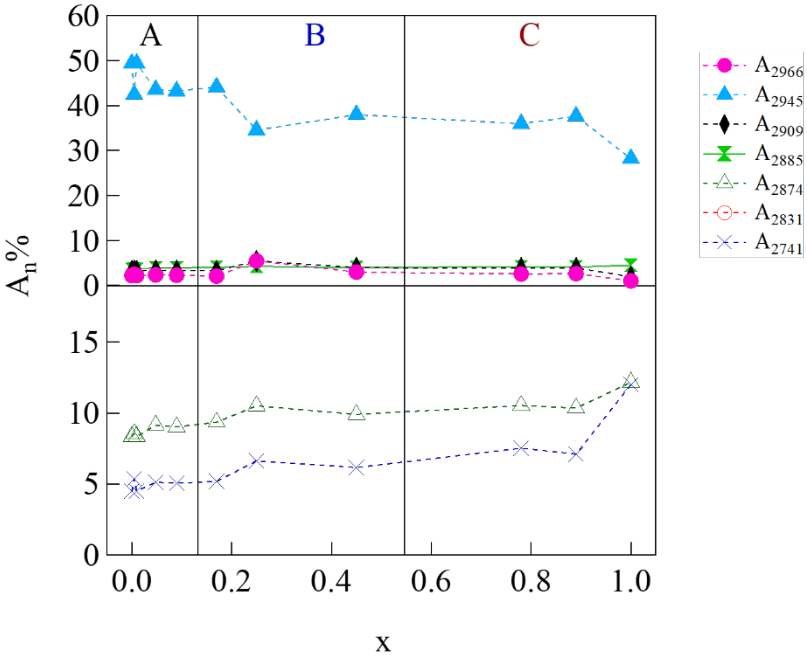


Figure S4. Areal behavior of the micro-Raman peaks as a function of x.

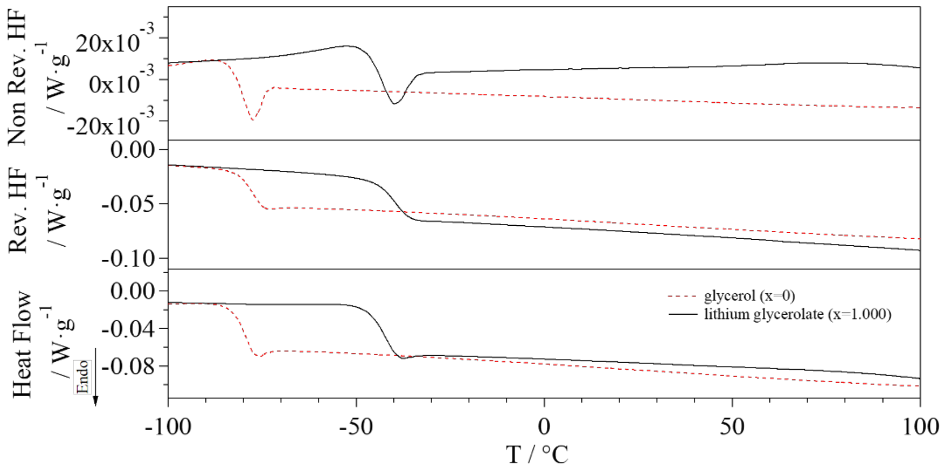
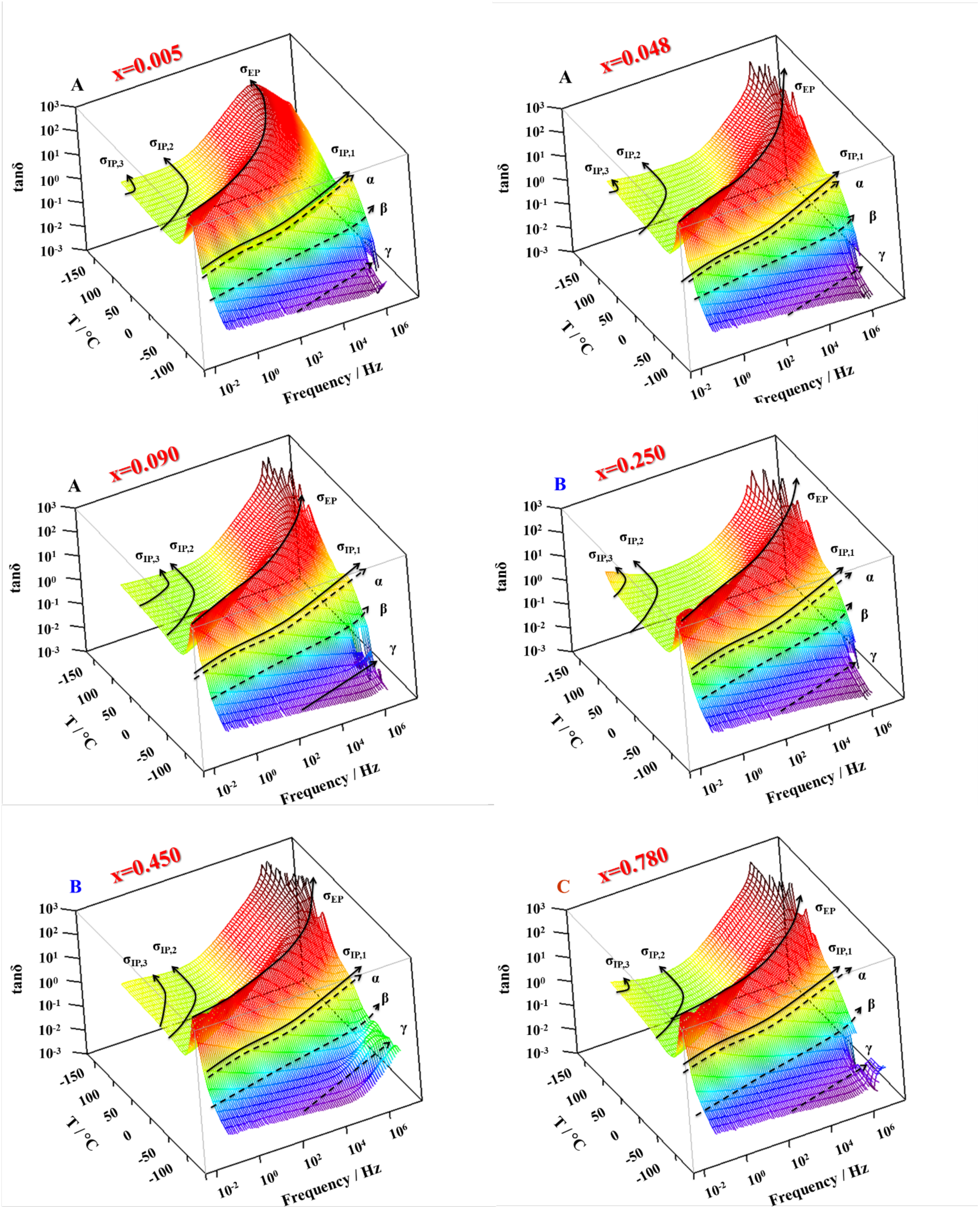


Figure S5. MDSC results of pristine glycerol, Gly (x = 0) and lithium glycerolate, GlyLi (x = 1.000) samples. The reversible and non-reversible heat flow contributions are distinguished in the two graphs.


A
x=0.005
A
x=0.048
A
x=0.090
B
x=0.250
B
x=0.450
C
x=0.780
σ_{EP}
$\sigma_{IP,1}$
$\sigma_{IP,2}$
$\sigma_{IP,3}$
α
β
γ
tanδ
T / °C
Frequency / Hz

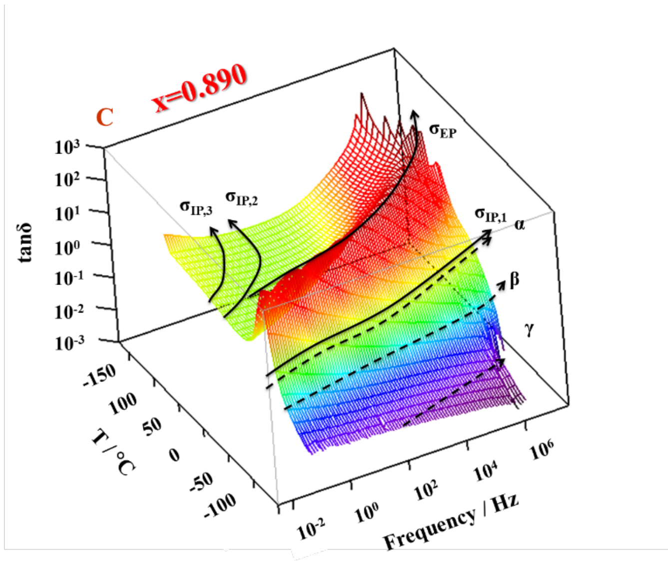


Figure S6. 3D tanδ surfaces of GlyLi$_x$ samples, with x = 0.005, 0.048, 0.090, 0.250, 0.450, 0.780, and 0.890.

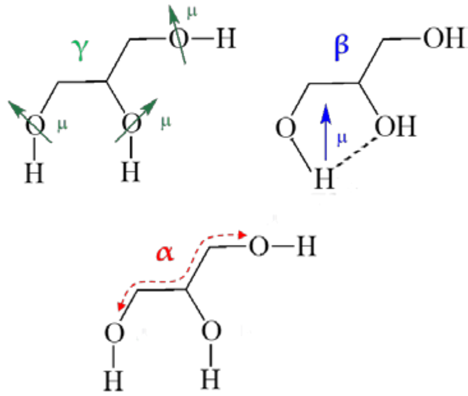


Figure S7. Representation of glycerol α, β, and γ dielectric relaxations; μ indicates the dipole moment.

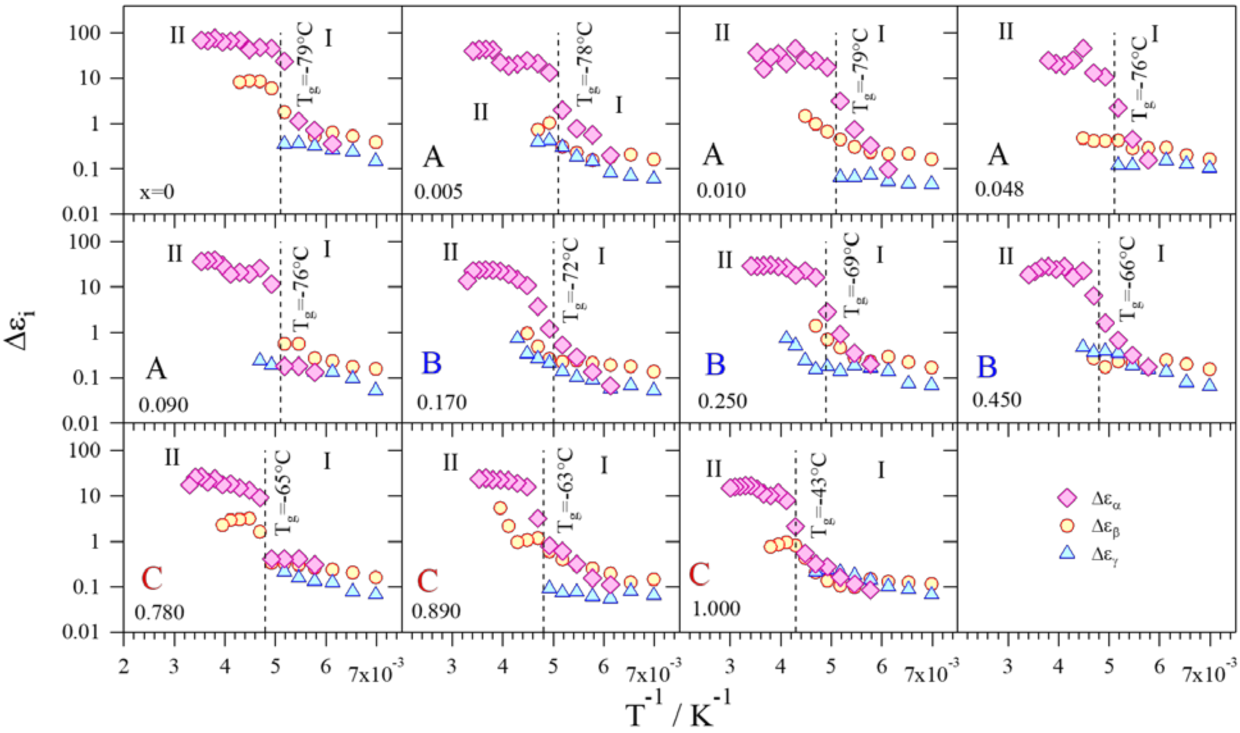


Figure S8. $\Delta\varepsilon_j$ *vs.* T^{-1} curves of each dielectric relaxation event for every sample. Region I and Region II are divided by the T_g of the sample.

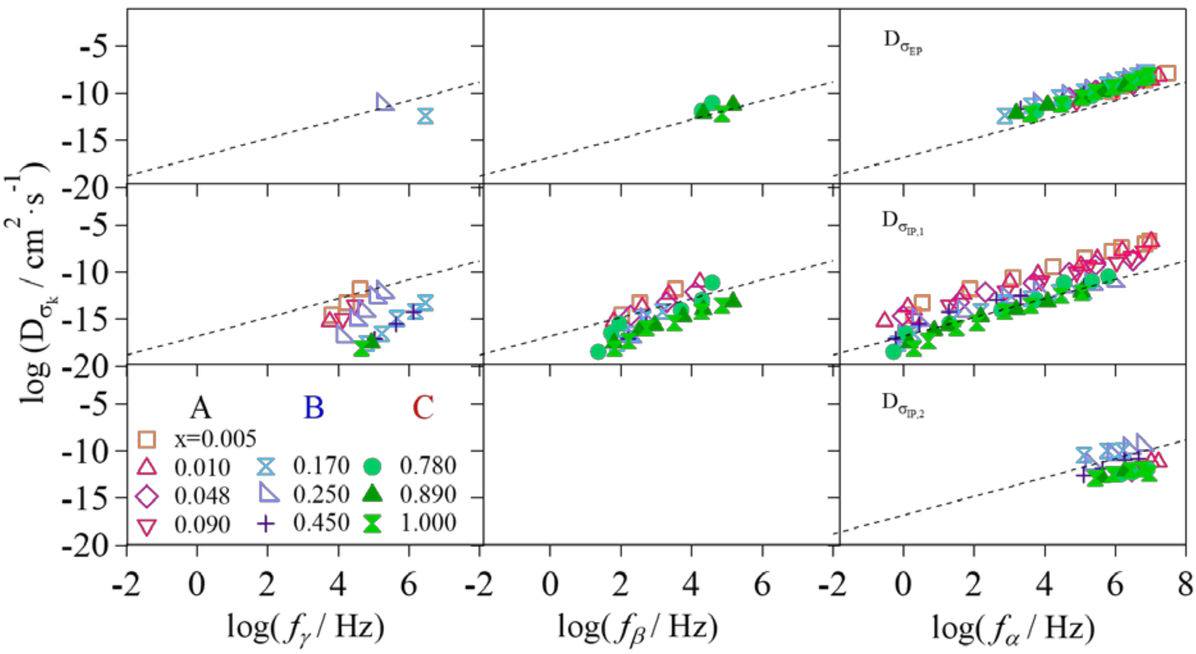


Figure S9. Diffusion coefficient calculated for each polarization (σ_{EP}, $\sigma_{IP,1}$, and $\sigma_{IP,2}$ rows), as a function of the dielectric relaxation frequencies (f_γ, f_β, and f_α, columns). Dotted lines represent the ideal glycerol diffusion coefficient.

Table S1. Activation energies calculated for each polarization phenomenon.

x	Group	Polarizations[1]				
		σ_0	σ_{EP}	$\sigma_{IP,1}$	$\sigma_{IP,2}$	$\sigma_{IP,3}$
		E_a / kJ·mol^{-1}	E_a / kJ·mol^{-1}	E_a / kJ·mol^{-1}	E_a / kJ·mol^{-1}	E_a / kJ·mol^{-1}
		I[2]	II	II	II	II
0	A	18±1	21.9±0.2	21.9±0.7	12.5±0.6	16±2
0.005	A	18±2	19.6±0.4	20.4±0.5	27±2	24±2
0.010	A	16±2	18.1±0.6	21.1±0.8	20.4±0.5	42.2±0.3
0.048	A	16±2	20.5±0.4	21.1±0.3	22.8±0.8	23.4±0.9
0.090	A	18±2	19.6±0.4	21.6±0.4	21±1	23±2
0.170	B	13±1	20.5±0.7	14.3±0.5	-	14±1
0.250	B	17±1	20.5±0.2	17.0±0.8	19±2	18.8±0.7
0.450	B	17±1	20.0±0.4	16.4±0.6	20.1±0.8	13.0±0.1
0.780	C	17±1	18.6±0.7	22±1	23.1±0.7	17.7±0.1
0.890	C	13±1	20.1±0.3	17.5±0.1	15.1±0.6	21.0±0.9
1.000	C	11±2	21.2±0.2	12±1	18±1	32.8±0.1

[1] Results are obtained from the fitting of polarization curves of Figure 9. [2] Temperature regions below (Region I) and above (Region II) the T_g of the samples.

Table S2. Activation energies calculated for each relaxation event.

x	Group	Relaxations[1]				
		α		β		γ
		E_a / kJ·mol^{-1}		E_a / kJ·mol^{-1}		E_a / kJ·mol^{-1}
		I[2]	II	I	II	I
0	A	23±1	18.1±0.7	22.0±0.5	75±3	22±2
0.005	A	29±2	20.9±0.5	31±2	59±5	20.9±0.9
0.010	A	16±1	22.7±0.5	24.8±0.8	61±3	13.7±0.4
0.048	A	23±2	23±1	24±2	80±1	16.5±0.6
0.090	A	35±2	20.57±0.06	18±2	-	21±1
0.170	B	22±2	17.3±0.7	20±2	36.63±0.03	29±1
0.250	B	25±2	20.0±0.2	27±1	-	21±1
0.450	B	14±1	19.9±0.7	30±2	-	36±2
0.780	C	24±1	19.6±0.4	20±1	120±10	18.0±0.7
0.890	C	20±2	17±1	22±1	60±3	23.1±0.7
1.000	C	20±3	14.8±0.6	18.378±0.004	77±4	25.8±0.7

[1] Results are obtained from the fitting of relaxation curves of Figure 11. [2] Temperature regions below (Region I) and above (Region II) the T_g of the samples.