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

Supplementary information of

Dynamics of supercooled water in a biological model system of the amino acid L-lysine

Silvina Cerveny[1,2*] and Jan Swenson[3]

[1] Centro de Física de Materiales- Material Physics Centre (MPC), CSIC- Universidad del País Vasco (UPV/EHU, Paseo Manuel de Lardizabal 5 (20018), San Sebastian, Spain

[2] Donostia International Physics Center, Paseo Manuel de Lardizabal 4, San Sebastián, Spain

[3] Department of Applied Physics, Chalmers University of Technology, SE-412 96 Göteborg, Sweden.

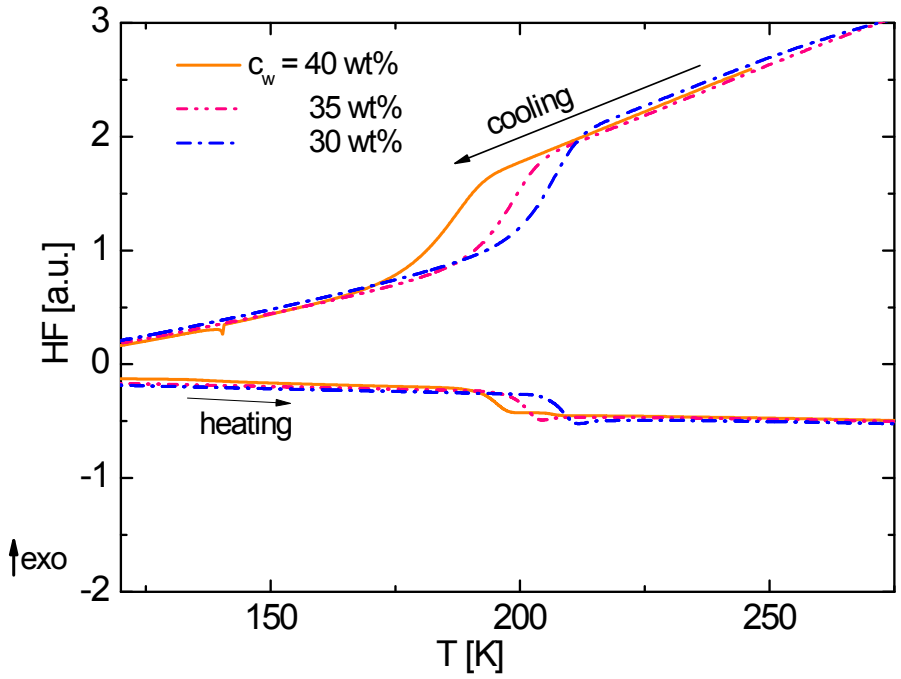

Figure S1. Heat flow measured by DSC during cooling and heating at a rate of 10 K/min for the highest water contents analyzed in this work. No calorimetric crystallization or melting events are observed for any of the samples.

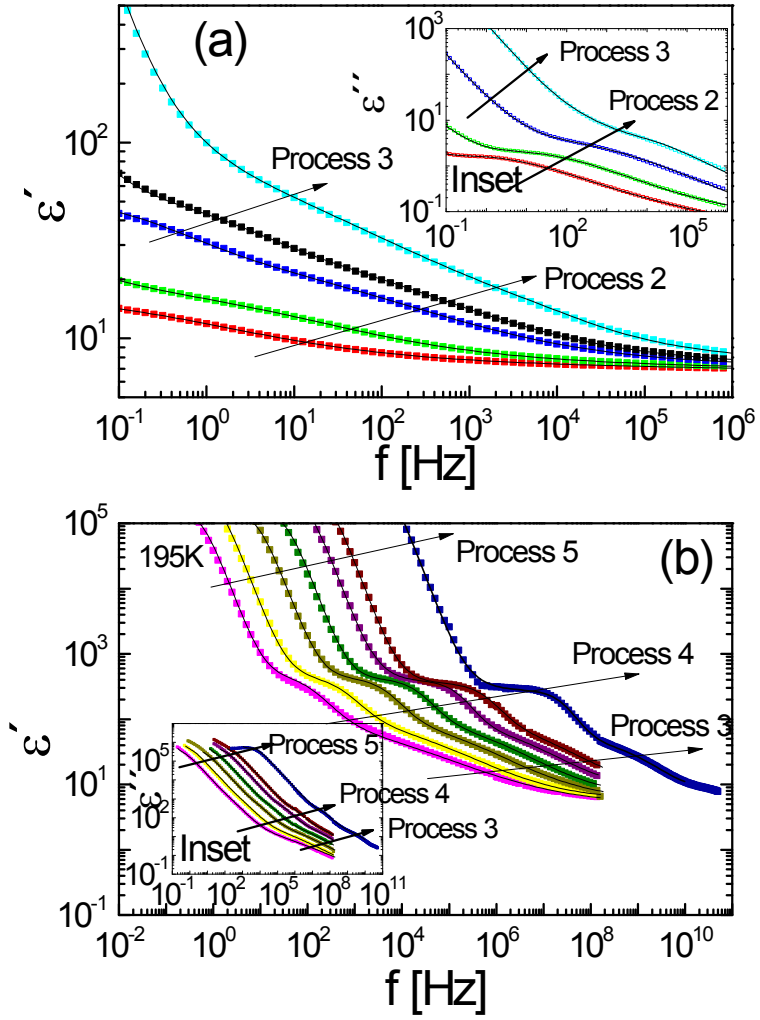

Figure S2. (a) Real and Imaginary part (inset) of the complex dielectric permittivity ($\varepsilon^*(\omega) = \varepsilon'(\omega) - i\,\varepsilon''(\omega)$) of lysine water solutions (c_w = 40 wt%) at temperatures lower than T_g (from left to right: 168, 180, 192, 195, 200 K respectively). Solid lines through the data points represent the fits to the experimental data. (b) Same as in (a) at temperatures higher than T_g (from left to right: 215, 220, 227.5, 235, 245, 255 and 296 K respectively).

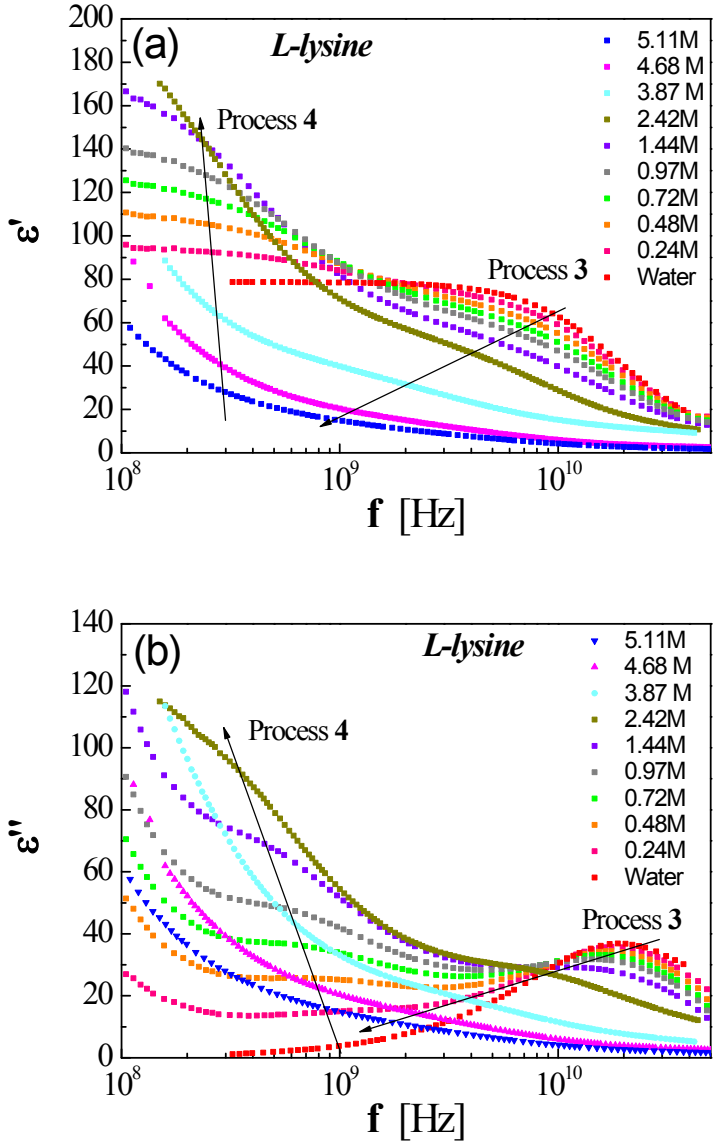

Figure S3 (a and b). Real ($\varepsilon'(\omega)$) and imaginary ($\varepsilon''(\omega)$) parts of the complex permittivity of aqueous solutions of lysine at 295.15 K. Symbols show experimental data whereas lines represent the total fitting function. Data for bulk water are also shown. Low concentration data were taken from Arteche et al, *Physical Chemistry Chemical Physics*, 2012, **14**, 11352.

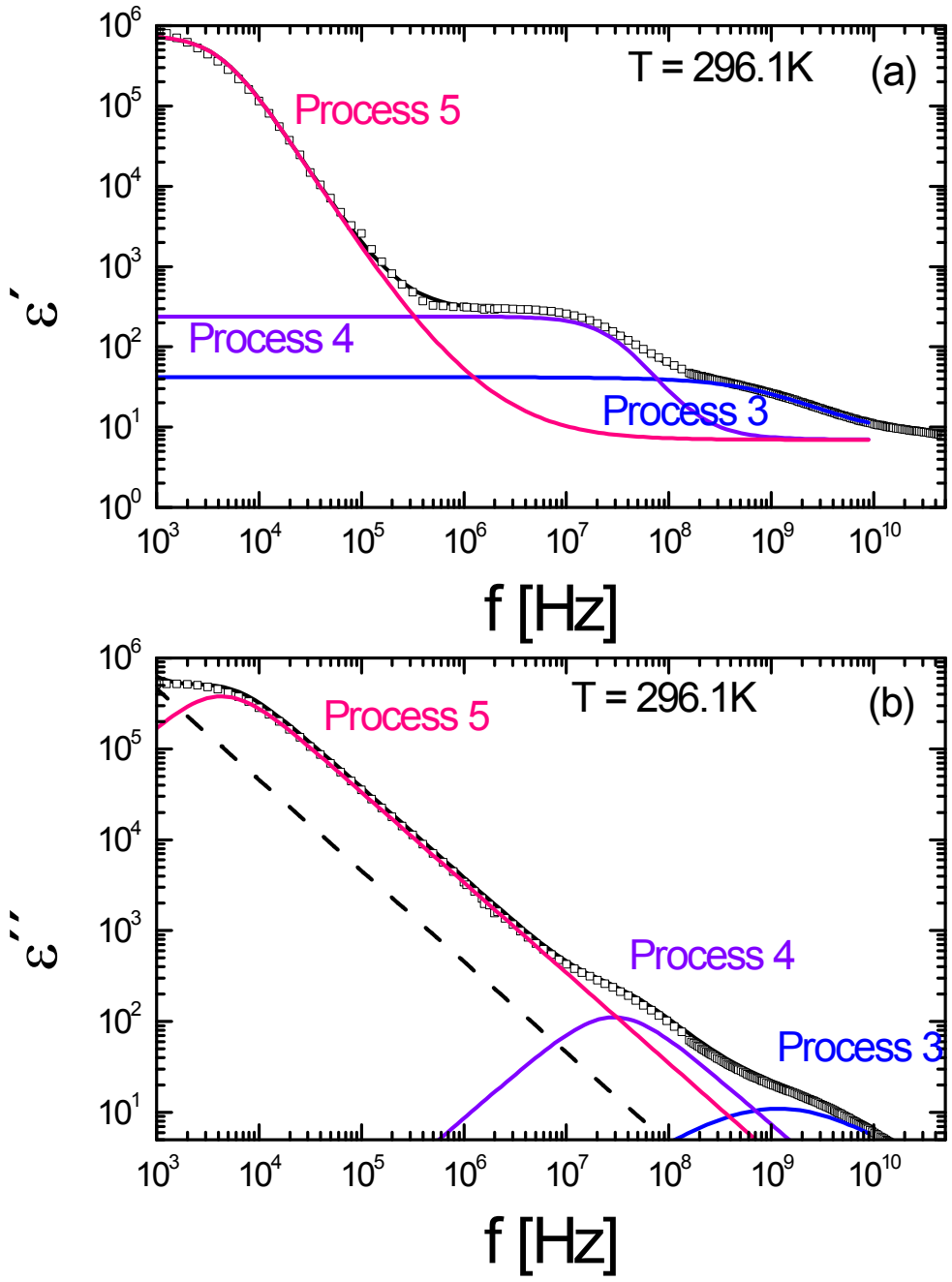

Figure S4 (a and b). Real (ε´) (a) and Imaginary part (ε´´) (b) of the complex dielectric permittivity $\varepsilon^*(f)$, of lysine-water solutions (c_w = 40wt%) at T = 296.1 K. At this temperature we observe three processes (3, 4 and 5). Dashed line in (b) represents a power law for conductivity.

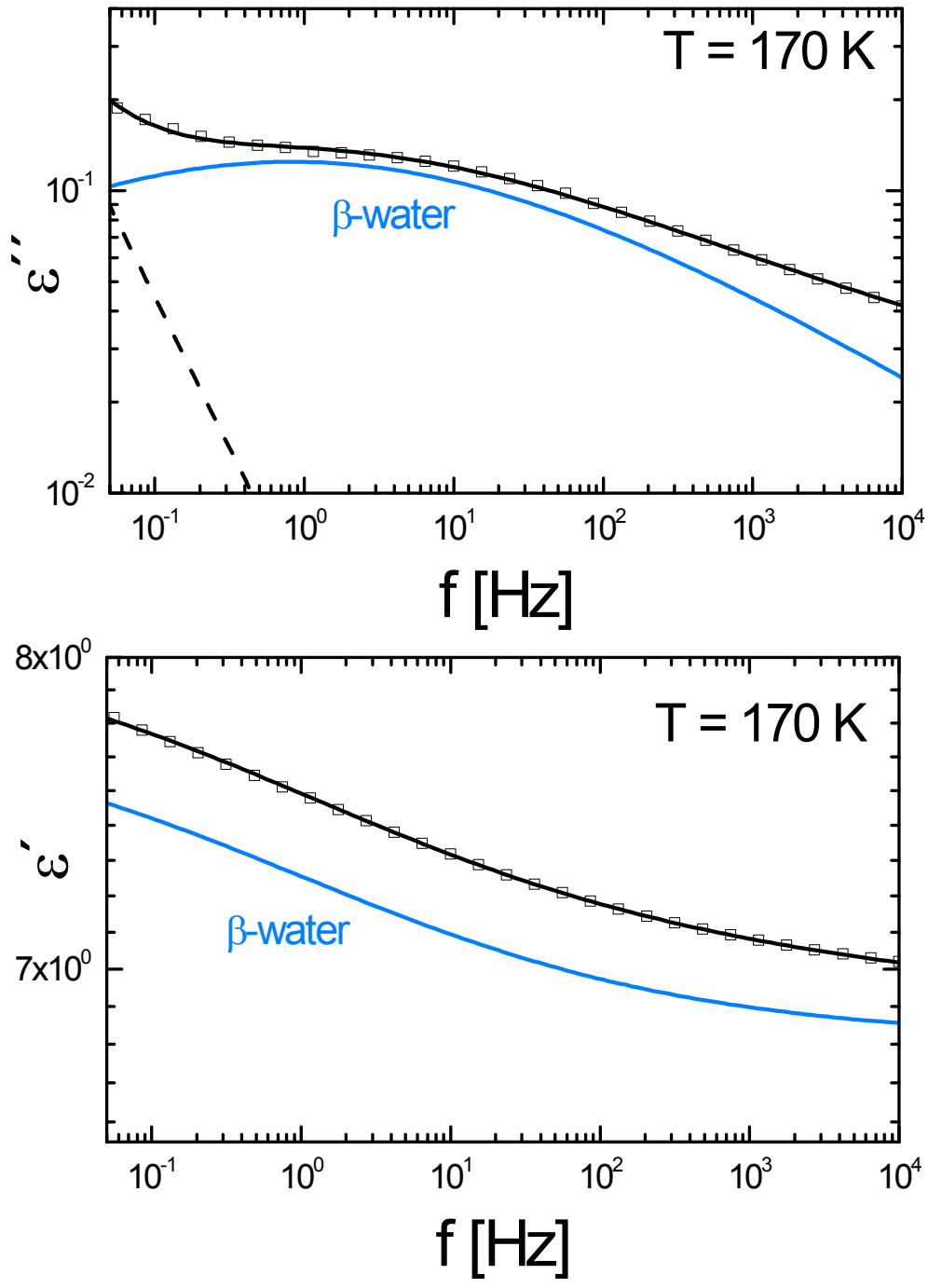

Figure S5 (a and b) **.** Real (ε´) and Imaginary part (ε´´) of the complex dielectric permittivity $\varepsilon^*(f)$, of wet powder lysine (c_w = 5 wt%) at T = 170 K. For this sample we only observe process 2. Dashed line in (a) represents a power law for the conductivity.

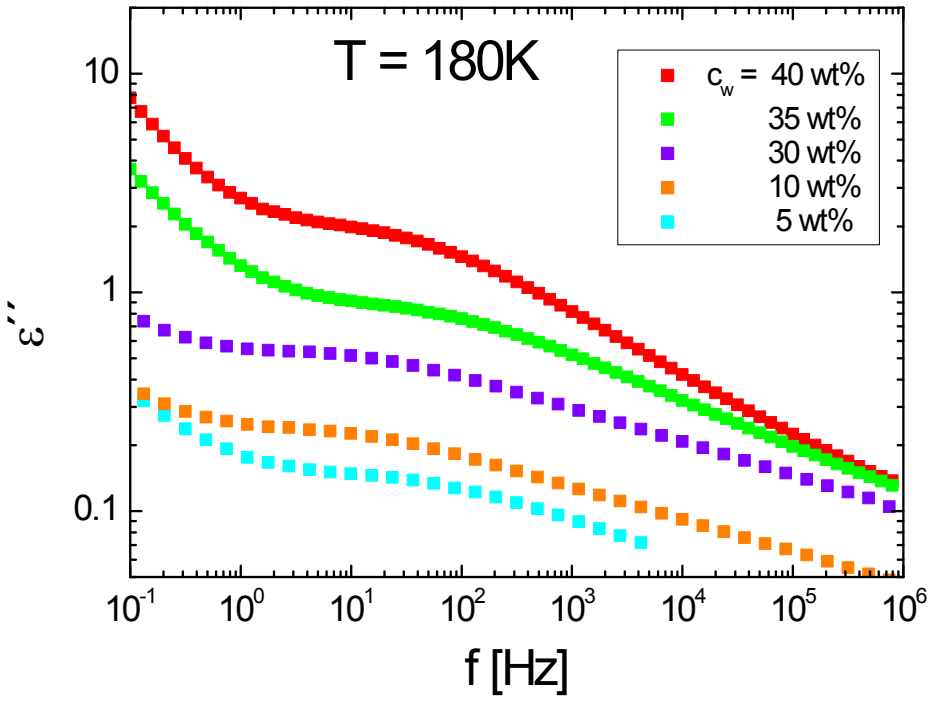

Figure S6. Imaginary ($\varepsilon''(\omega)$) part of the complex permittivity of aqueous solutions of lysine at 180 K for different water contents. The dielectric signal of processes 1 to 3 increases with increasing water content.

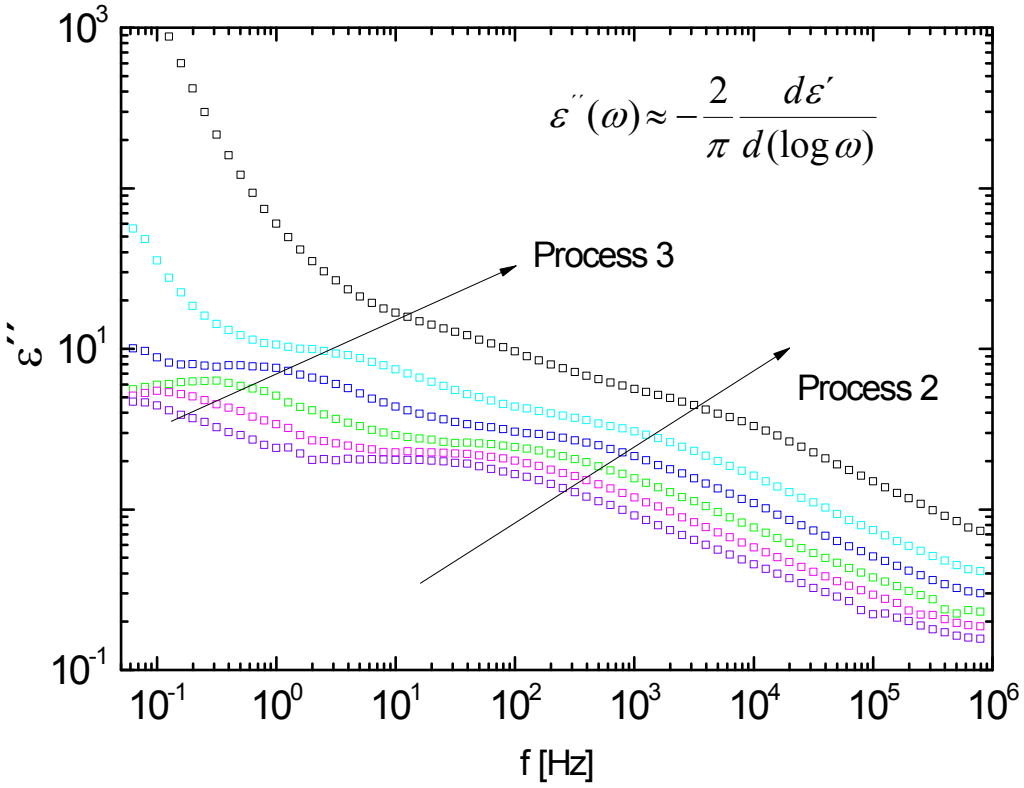

Figure S7. Dielectric response of lysine-water solutions for c_w = 40 wt% at 183, 186, 189, 192, 195 and 200 K (from left to right, respectively). The derivative of ε' is similar to ε'', but has no conductivity contribution that dominates ε´´ spectra at lower frequencies.