Supporting information

NMR of Na^+, glycine and HDO in isotropic and anisotropic carrageenan gels

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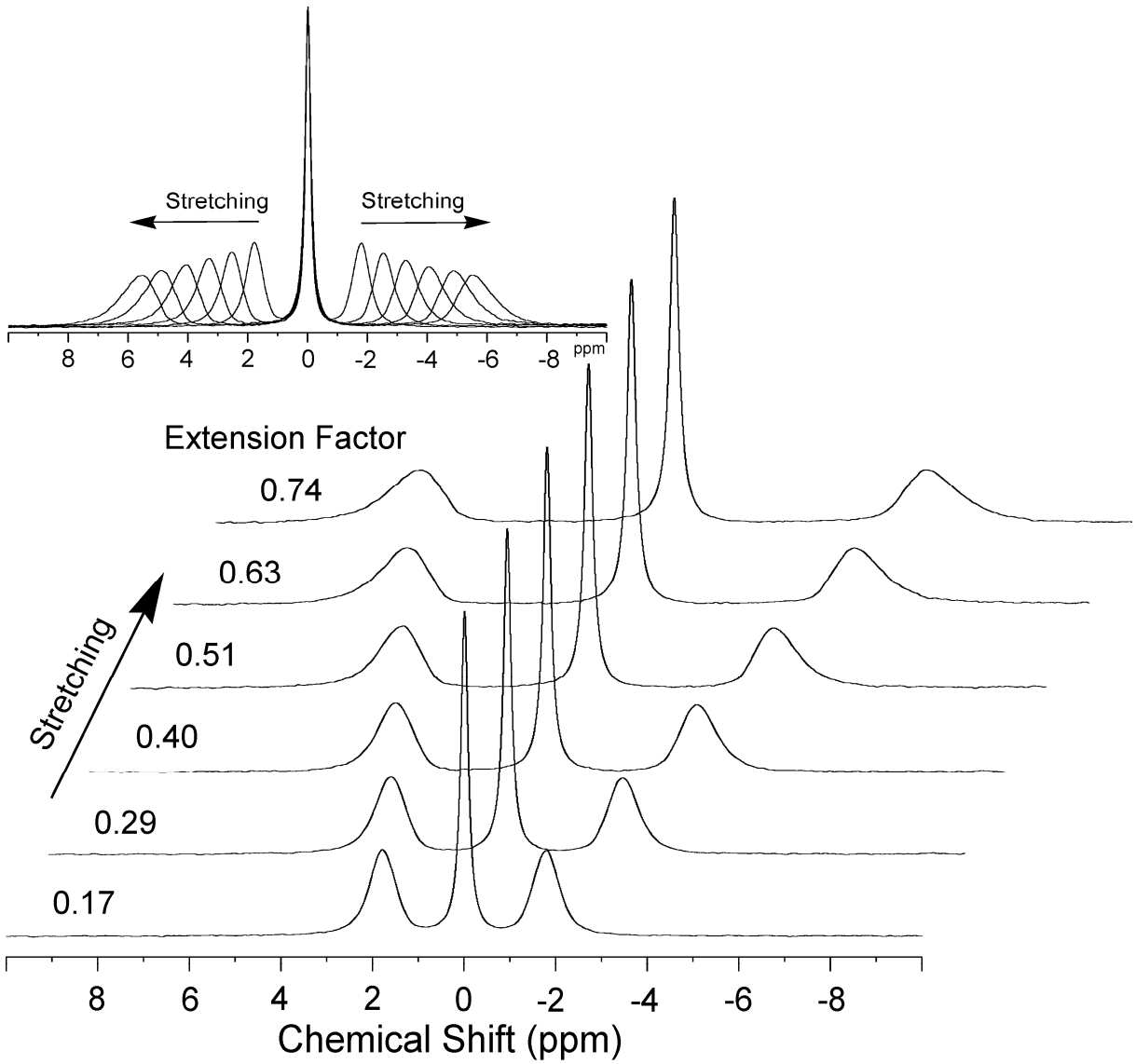

Figure S1. ^{23}Na single-quantum NMR spectra of a 2.9% (w/w) *ι*-carrageenan gel prepared with 253 mmol L^{-1} NaCl stretched at six different extensions thus reversibly varying the anisotropy of the sample. The maximum degree of HDO anisotropy was a residual quadrupolar splitting of 10.2 Hz. The central signals of the six quadrupolar triplets had almost identical amplitudes and widths, whereas the satellites increased in width with increasing anisotropy. In all cases, the ratio of areas for satellite: centre: satellite signal corresponded to the 3:4:3 theoretical values for homogeneous anisotropy.

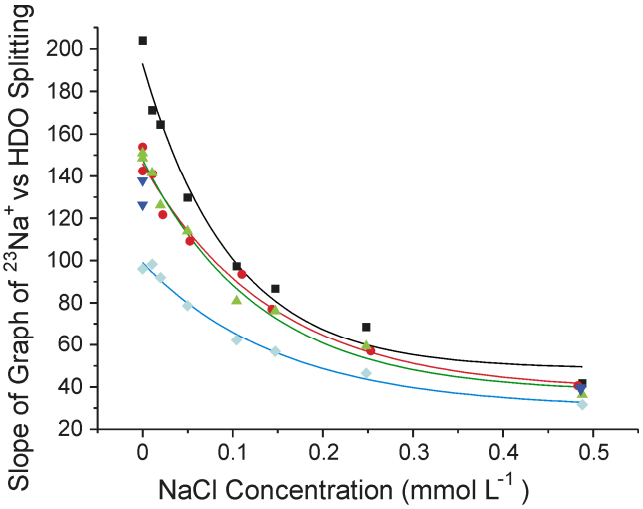

Figure S2. Slopes of $^{23}Na^+$ versus HDO quadrupolar splittings ($^{Na+}A^{HDO}$) for 2-5% (w/w) *ι*-carrageenan gels prepared with buffers containing different concentrations of NaCl as well as different concentrations of glycine (mmol L^{-1}), versus NaCl concentration. Black squares, 2% *ι*-carrageenan gel concentration, 99.0; red circles, 3% and 0.0; green up-facing triangles, 3% and 99.0; blue down-facing triangles, 3% and 520; and sky-blue diamonds, 5% and 99.0.

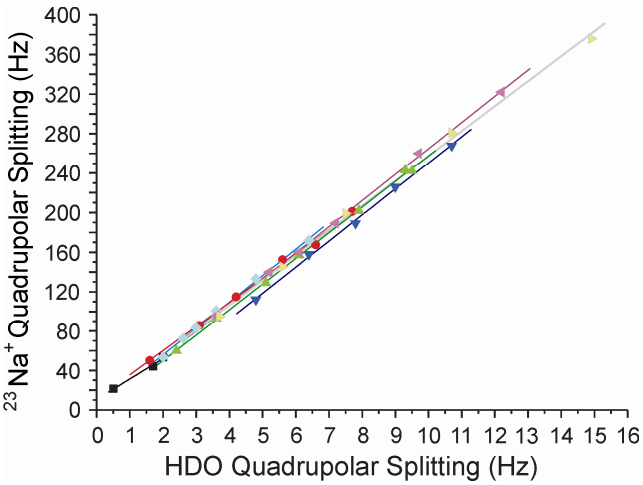

Figure S3. $^{23}Na^+$ versus HDO quadrupolar splittings recorded for variably stretched gels of different κ-carrageenan concentration prepared with buffer containing between 143-147 mmol L^{-1} NaCl. Black squares, 1.0% (w/w) κ-carrageenan gel concentration; red circles, 2.0%; green up-facing triangles, 3.0%; blue down-facing trangles, 5.0% (all 147 mmol L^{-1} NaCl and 99.0 mmol L^{-1} glycine); sky-blue diamonds, 1.5%; magenta triangles, 3.0%; yellow grey-rimmed triangles, 5.1% (all 143 mmol L^{-1} NaCl and 2% v/v DMSO-d_6). The small amount of DMSO-d_6 in some samples did not visually affect the rheological properties of the particular samples.

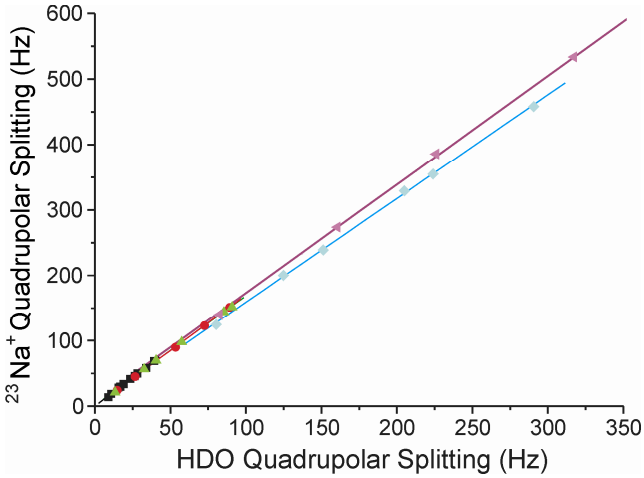

Figure S4. $^{23}Na^+$ versus HDO quadrupolar splittings recorded for variably stretched gels of different gelatin concentrations prepared with the same buffer containing 147 mmol L^{-1} NaCl (including 99.0 mmol L^{-1} glycine). Black squares, 5.0% (w/w) gelatin gel concentration; red circles, 10.1%; green up-facing triangles, 15.3%; sky-blue diamonds, 30.2%; and magenta triangles, 50.4%.

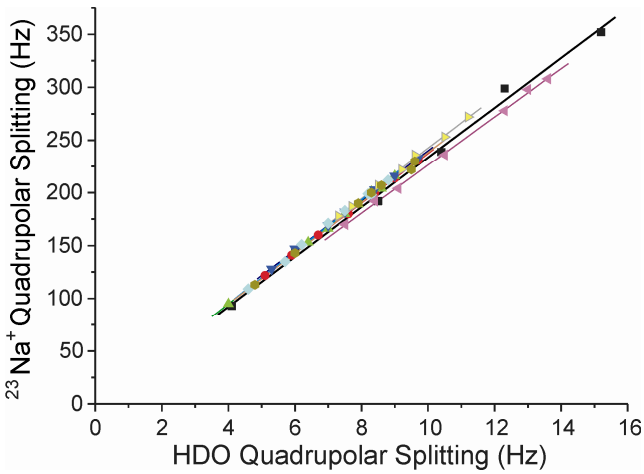

Figure S5. $^{23}Na^+$ versus HDO quadrupolar splittings recorded at temperatures between 15-45°C for variably stretched gels of 3.0% (w/w) κ-carrageenan prepared with buffers containing 147 mmol L^{-1} NaCl (including 99.0 mmol L^{-1} glycine). Black squares, 15°C; red circles, 25°C; green up-facing triangles, 35°C; blue down-facing trangles, 35°C; sky-blue diamonds, 45°C; magenta triangles, 15°C; yellow grey-rimmed triangles, 15°C; and dark-brown hexagons, 35°C.