Supplementary Information – Grupi & Minton

Figure S1. Schematic of sample mixing vial. A small stirring motor is connected to a custom made plug which seals the sample vial. A custom fabricated stainless steel paddle connected to the stirring motor provides solution mixing. Inlet and outlet tubing enter the vial through the plug. The vial is mounted at an angle to the vertical to enable outlet tubing to access all of the vial contents.

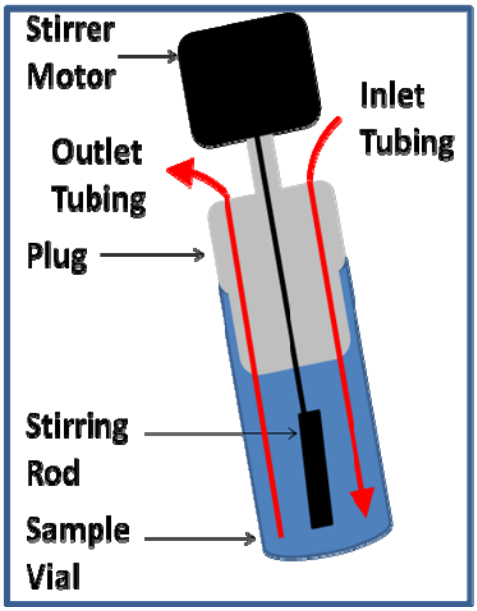

Figure S2. Example of raw data collected during a single experiment. The data shown was taken from a concentration gradient (5% volume steps) of a BSA solution at 25°C. At each concentration the differential pressure created by solution flow through the capillary tubing was measured at two flow rates. The black trace is the data collected from the low sensitivity sensor (±30 psi maximum) and the red trace is the data collected from the high sensitivity sensor (±5 psi maximum), which is activated by opening the manual valves only when the pressure is well inside the pressure rating for this sensor. The gray areas are automatically calculated by the software in the data analysis procedure following data collection, and indicate the range of data points over which the mean and standard deviation of viscosity will be calculated for each combination of dilution and shear rate.

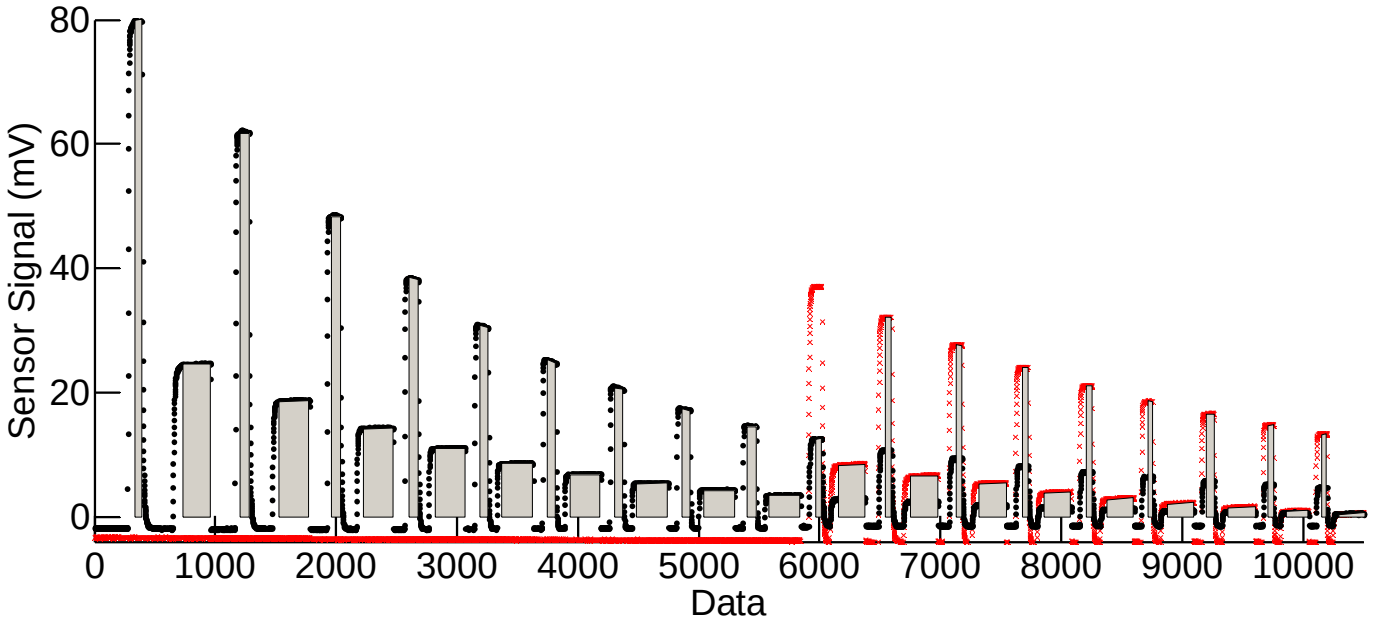

Figure S3. Automated dilution validation. (A-C) 1ml fluorescein solutions of low viscosity were diluted at 10% (A), 5% (B)and 2% (C) volume fractions. the absorbance of the volume fractions removed at each dilution step was measured at 440nm, and normalized to the solution absorbance at the initial concentration. (D) A 2% volume dilution of a 1ml solution of 70.6% sucrose at room temperature. Sucrose concentration was determined by measuring the refractive index at each dilution step and using published data for the refractive index dependence on %Mass. A linear fit (---) of the calculated percent solute concentration at each step of the gradient relative to the initial concentration, (x-axis) to the experimentally determined solute concentration (relative to the initial concentration) validates the dilution apparatus with a slope of 1.002-1.012 and a Y-intercept of 0.063-0.15. The good agreement of the data to a linear fit validates the effective mixing and dilution apparatus for a ~350cP solution. (●– experimental data).

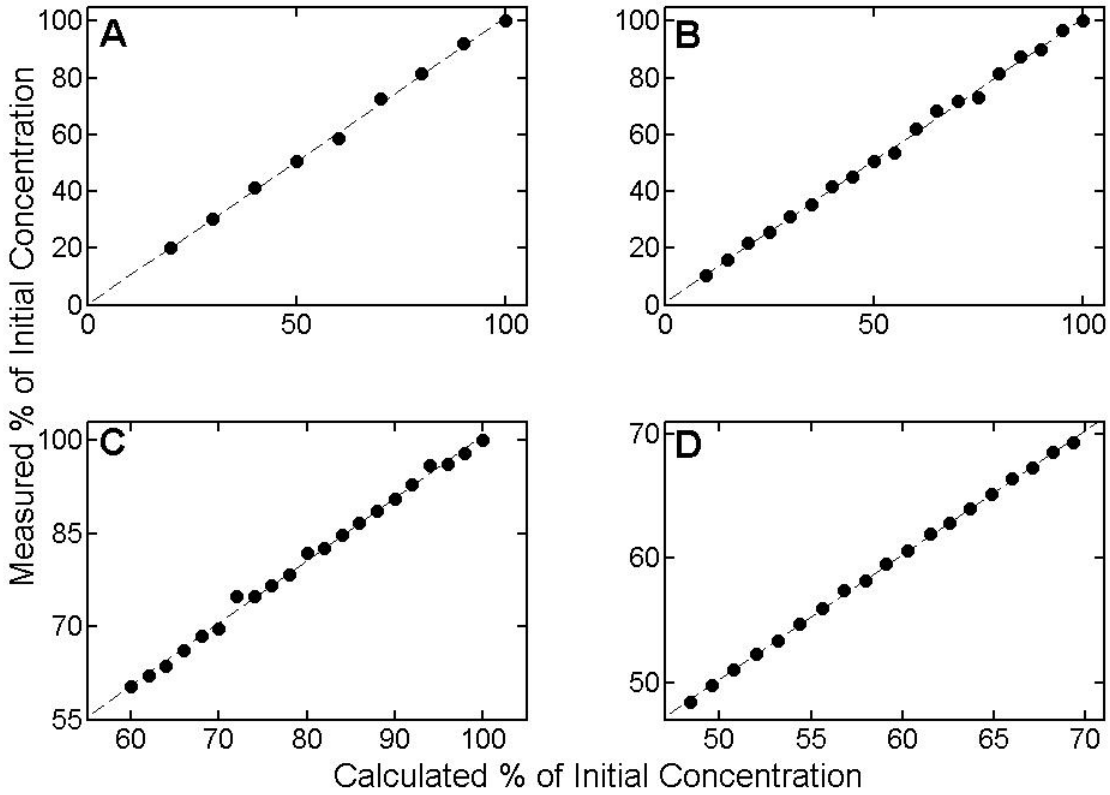

Figure S4. Verification of proportionality of differential pressure and flow rate. The voltage produced by the differential pressure sensor in response to the flow of a 50% w/w glycerol solution, plotted as a function of flow rate (ml/min) and a plot of the residuals.

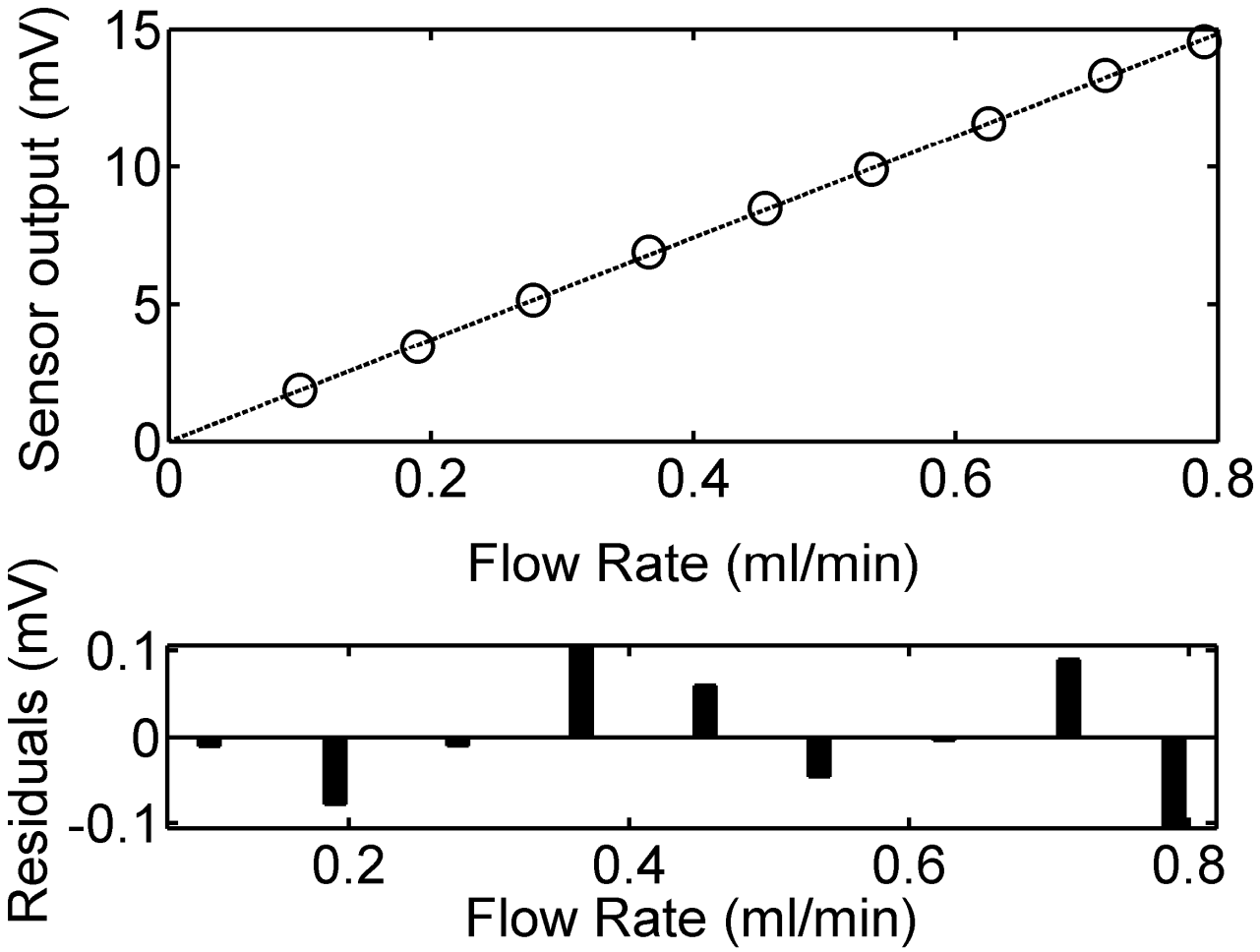

Figure S5. Intrinsic viscosity of PEG solutions plotted as a function of molecular weight. Black triangles are published data (text reference 8), and red circles are obtained by fitting of equation [8] to data obtained in the present study.