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Supplementary Material of Manuscript

Continuous Separation of Microparticles in a Microfluidic Channel via the Elasto-inertial Effect of Non-Newtonian Fluid

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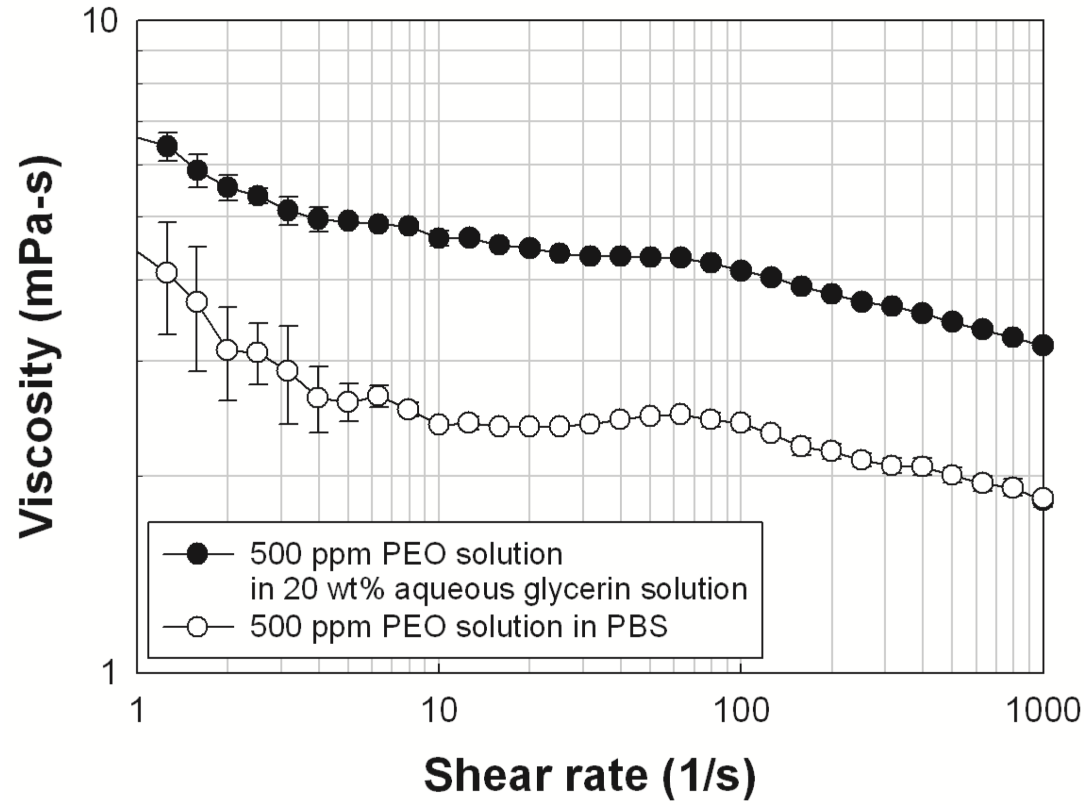

Fig. S-1 Viscosities of non-Newtonian fluids. Rheological measurements of viscosities were done using a controlled shear stress rheometer (AR2000, TA instruments) with a double gap Couette cell and a pressure-driven viscometer (Rheoscan-D 200, Rheomeditech, Korea) at shear rates of $1 < \gamma < 10^3\ s^{-1}$. Since aqueous PEO solutions (500 ppm) in two solvents showed a typical shear-thinning viscosity, the mean viscosity as characteristic viscosity is dependent on shear rate. Mean viscosity can be defined at an average shear rate ($\dot{\gamma}_c = 2Q/hw^2$).

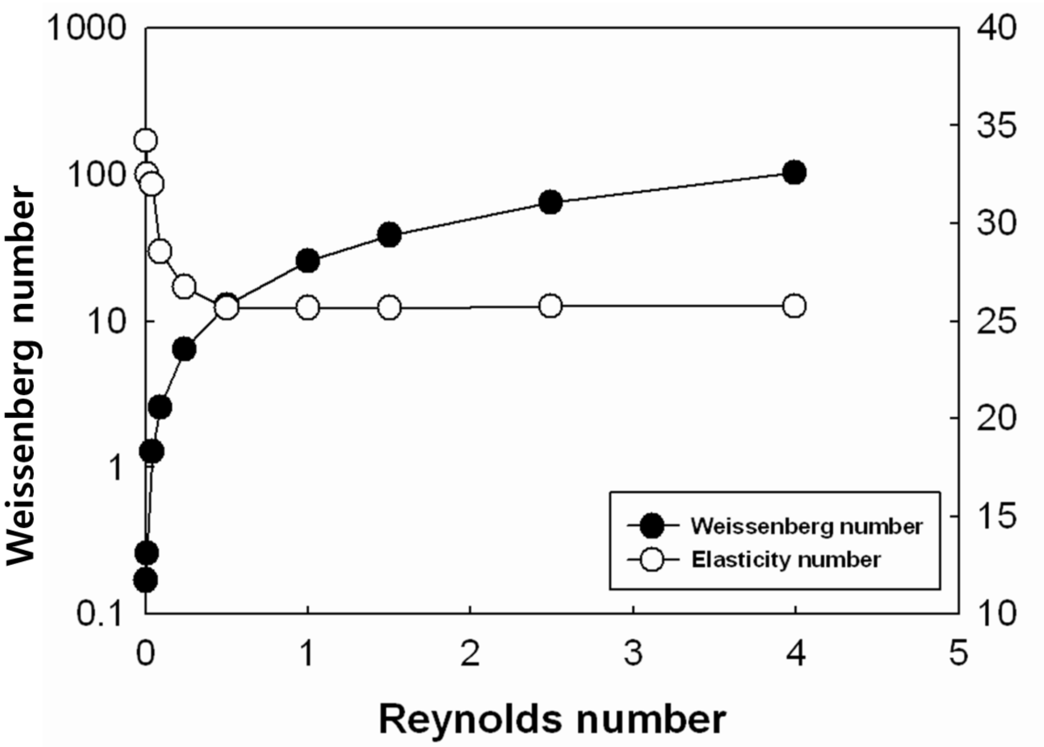

Fig. S-2 Characterization of elasto-inertia flow in a microchannel on a *Wi-Re-El* diagram. Note that the Reynolds number (*Re*) and Weissenberg number (*Wi*) are proportional to flow rate, as shown in Eqs. (1) and (2). As *Re* increased, *Wi* increased but *El* decreased exponentially. The variations of *Wi* and *El* with increasing flow rate was associated with shear-dependent characteristic viscosity, η_c., used in the definition of the dimensionless numbers. However, when η_c reached infinite shear viscosity at sufficiently high flow rates, *El* did not vary with flow rate and became independent of *Re*. For instance, at sufficiently high flow rates (i.e., $Re = 0.5 \sim 4.0$), *Wi* increased ($12.8 \sim 103$) but *El* was remained nearly constant (25.7). The flow rate-independence of the elasticity number was also reported when zero-shear was adopted.[61] It is worthy to note that in the asymptotic region of the elasticity number (i.e., at a fixed *El*), the degree of particle migration was dependent on flow rate.