

Continuous Sheathless Particle Separation in Viscoelastic Fluids with Different Rheological Properties

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Figure S1. Distributions of 4 μ m and 10 μ m particles in 0.1 wt% PVP solution (El = 0.073) at various flow rates.

Table S1. Separation efficiency and purity of 4 μ m and 10 μ m spherical particles in 0.1wt%PVP solution (El = 0.07) at different flow rates.

Figure S2. Distributions of 4 μ m and 10 μ m particles in 0.3wt%PVP solution (El = 0.21) at various flow rates.

Table S2. Separation efficiency and purity of 4 μ m and 10 μ m spherical particles in 0.3wt%PVP solution (El= 0.21) at different flow rates.

Figure S3. Distributions of 4 μ m and 10 μ m particles in 0.75 wt% PVP solution (El = 1.10) at various flow rates.

Table S3. Separation efficiency and purity of 4 μ m and 10 μ m spherical particles in 0.75wt%PVP solution (El = 1.10) at different flow rates.

Figure S4. Distributions of 4 μ m and 10 μ m particles in 2 wt% PVP solution (El = 8.43) at various flow rates.

Table S4. Separation efficiency and purity of 4 μ m and 10 μ m spherical particles in 2 wt%PVP solution (El = 8.43) at different flow rates.

Figure S5. Distributions of 4 μ m and 10 μ m particles in 5 wt% PVP solution (El = 83.52) at various flow rates.

Table S5. Separation efficiency and purity of 4 μ m and 10 μ m spherical particles in 5 wt%PVP solution (El = 83.52) at different flow rates.

Figure S6. Distributions of 4 μ m and 10 μ m particles in the 8 wt% PVP solution (El = 340.41) at various flow rates (second-stage channel with plane geometric structure).

Figure S7. Distributions of 4 μ m and 10 μ m particles in the 8 wt% PVP solution (El = 340.41) at various flow rates (second-stage channel with sharp geometric structure).

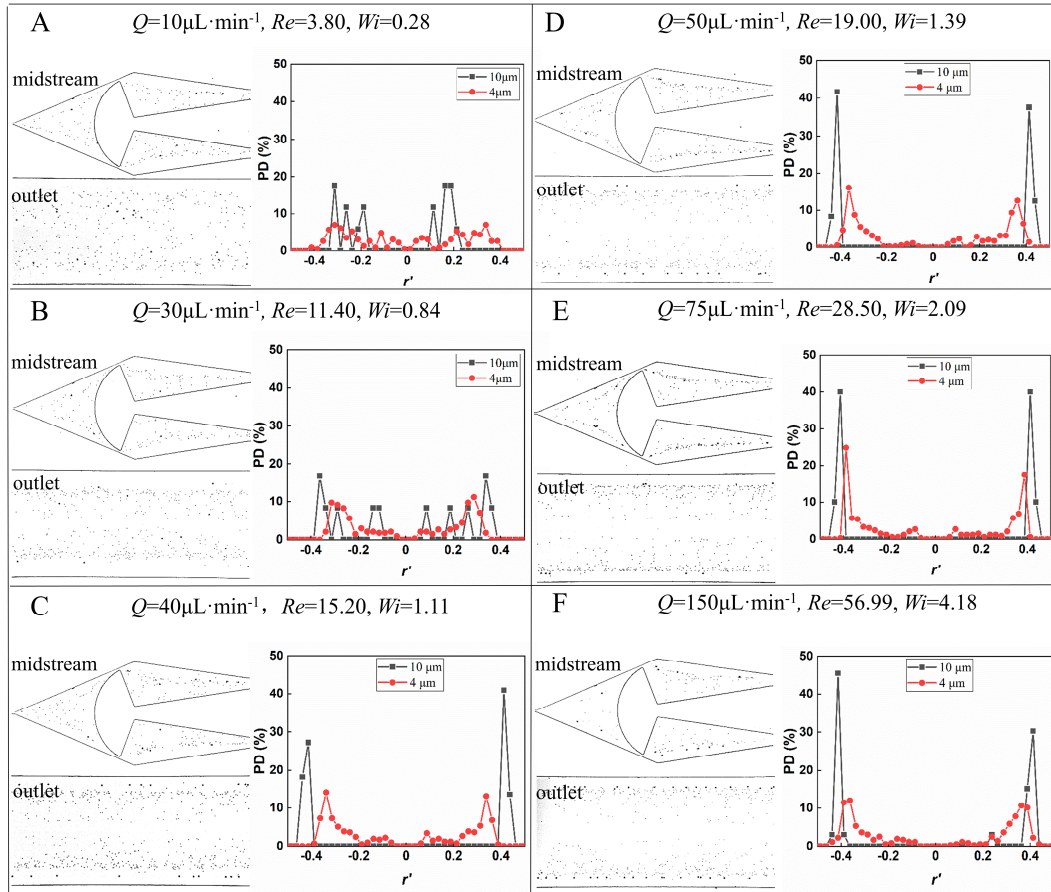


Figure S1. Experimental results of spherical particles of 4 μm and 10 μm in 0.1 wt% PVP solution ($El = 0.07$) at different flow rates.

Table S1. Separation efficiency and purity of 4 μm and 10 μm spherical particles in 0.1wt%PVP solution ($El = 0.07$) at different flow rates.

Flow rate ($\mu\text{L}/\text{min}$)	Wi	Re	η (10 μm particle)	p (10 μm particle)	η (4 μm particle)	p (4 μm particle)
10	0.28	3.80	0.706	0.126	0.670	1.000
30	0.84	11.40	0.500	0.079	0.794	0.978
40	1.11	15.20	1.000	0.815	0.988	1.000
50	1.39	19.00	1.000	0.348	0.868	1.000
75	2.10	28.50	1.000	0.065	0.569	1.000
150	4.18	57.00	1.000	0.252	0.788	1.000

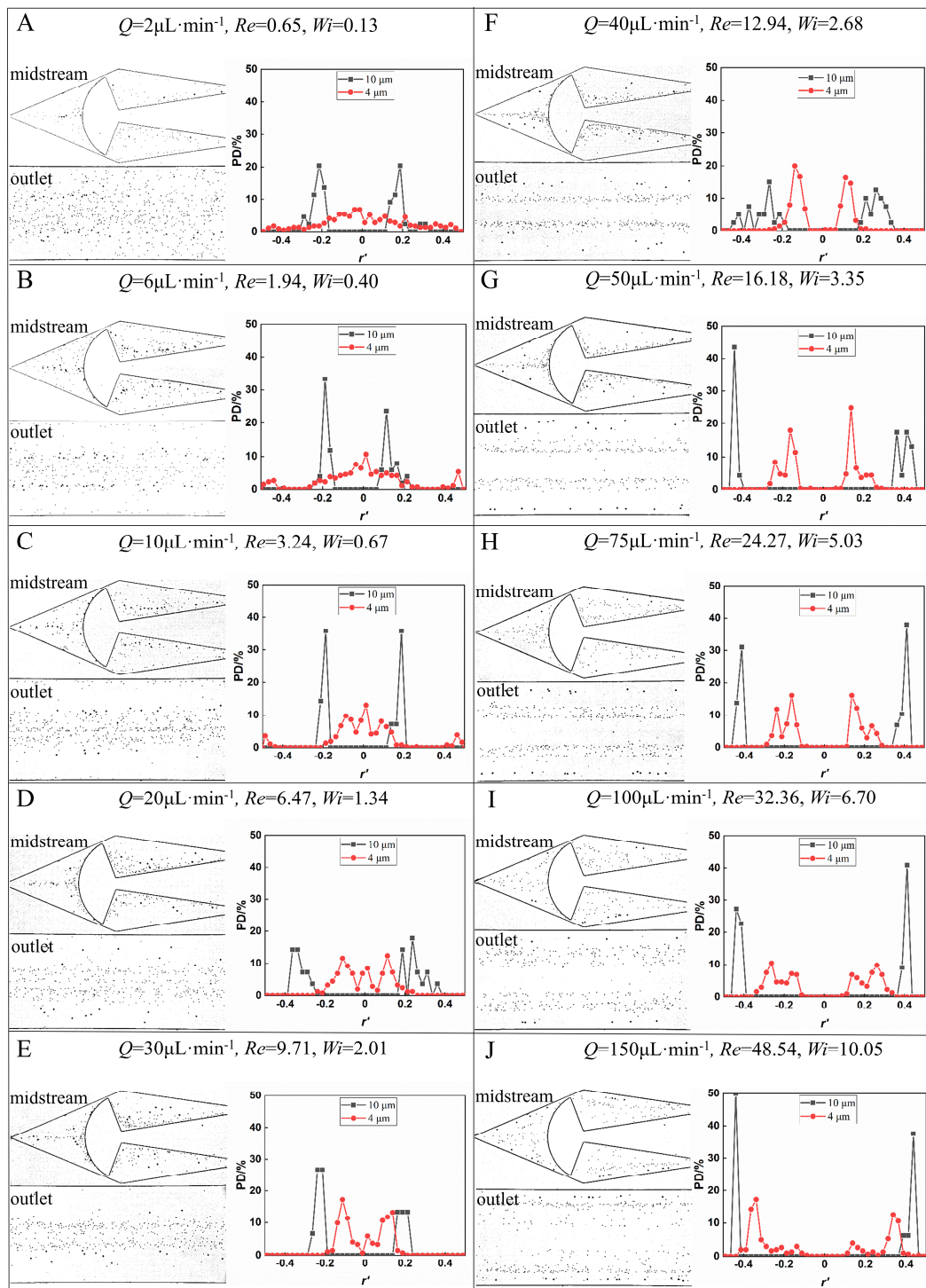


Figure S2. Distributions of 4 μm and 10 μm particles in 0.3wt%PVP solution ($El = 0.21$) at various flow rates.

Table S2. Separation efficiency and purity of 4 μm and 10 μm spherical particles in 0.3wt%PVP solution ($El = 0.21$) at different flow rates.

Flow rate ($\mu\text{L}/\text{min}$)	Wi	Re	η (10 μm particle)	p (10 μm particle)	η (4 μm particle)	p (4 μm particle)
2	0.13	0.65	0.909	0.305	0.804	0.989
10	0.67	3.24	0.929	0.406	0.900	0.997

20	1.34	6.47	0.821	0.885	0.988	0.984
30	2.01	9.71	1.000	0.625	0.967	1.000
40	2.68	12.94	0.650	0.720	0.971	0.960
50	3.35	16.18	1.000	1.000	1.000	1.000
75	5.03	24.27	1.000	1.000	1.000	1.000
100	6.70	32.36	1.000	1.000	1.000	1.000
150	10.05	48.54	1.000	0.471	0.940	1.000

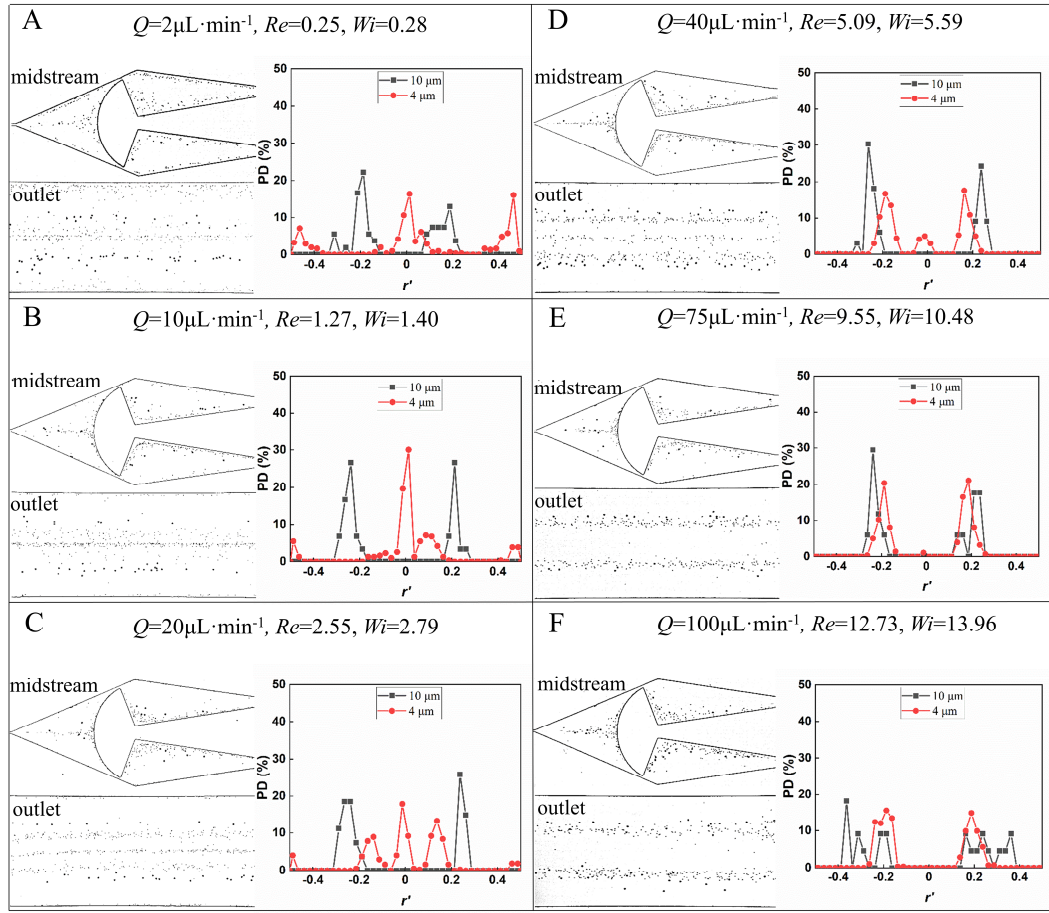


Figure S3. Experimental results of spherical particles of 4 μm and 10 μm in 0.75 wt% PVP solution ($El = 1.10$) at different flow rates.

Table S3. Separation efficiency and purity of 4 μm and 10 μm spherical particles in 0.75wt%PVP solution ($El = 1.10$) at different flow rates.

Flow rate ($\mu\text{L}/\text{min}$)	Wi	Re	η (10 μm particle)	p (10 μm particle)	η (4 μm particle)	p (4 μm particle)
2	0.28	0.25	0.833	0.833	0.971	0.971
10	1.40	1.27	0.967	0.967	0.997	0.997
20	2.79	2.55	0.963	0.897	0.992	0.992
40	5.57	5.09	0.968	0.938	0.995	0.998

75	10.48	9.54	0.939	0.508	0.912	0.994
100	13.97	12.72	0.500	0.846	0.993	0.962

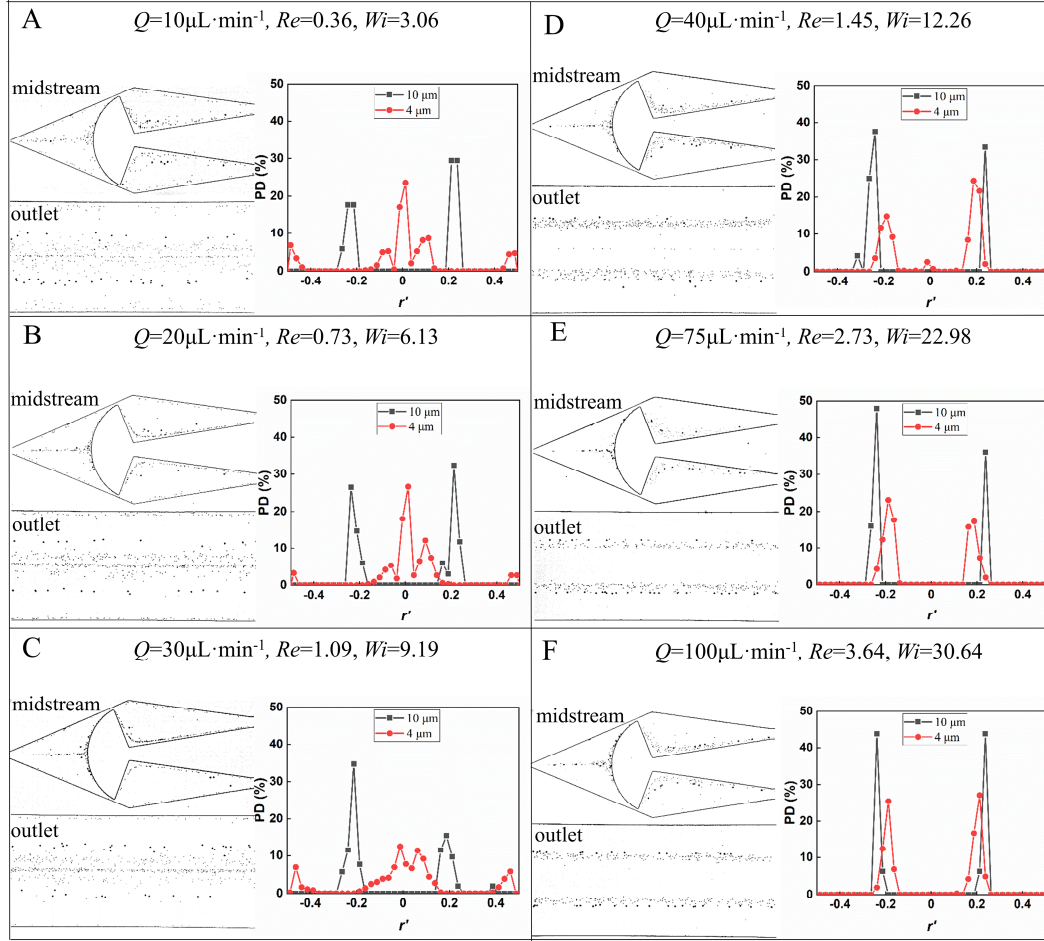


Figure S4. Experimental results of spherical particles of 4 μm and 10 μm in 2 wt% PVP solution ($El = 8.43$) at different flow rates.

Table S4. Separation efficiency and purity of 4 μm and 10 μm spherical particles in 2 wt%PVP solution ($El = 8.43$) at different flow rates.

Flow rate ($\mu\text{L}/\text{min}$)	Wi	Re	η (10 μm particle)	p (10 μm particle)	η (4 μm particle)	p (4 μm particle)
10	3.06	0.36	1.000	0.944	0.997	1.000
20	6.13	0.73	1.000	0.895	0.988	1.000
30	9.19	1.09	1.000	0.750	0.971	1.000
40	12.26	1.45	1.000	0.522	0.944	1.000
75	22.98	2.73	1.000	0.417	0.865	1.000
100	30.64	3.64	1.000	0.184	0.536	1.000

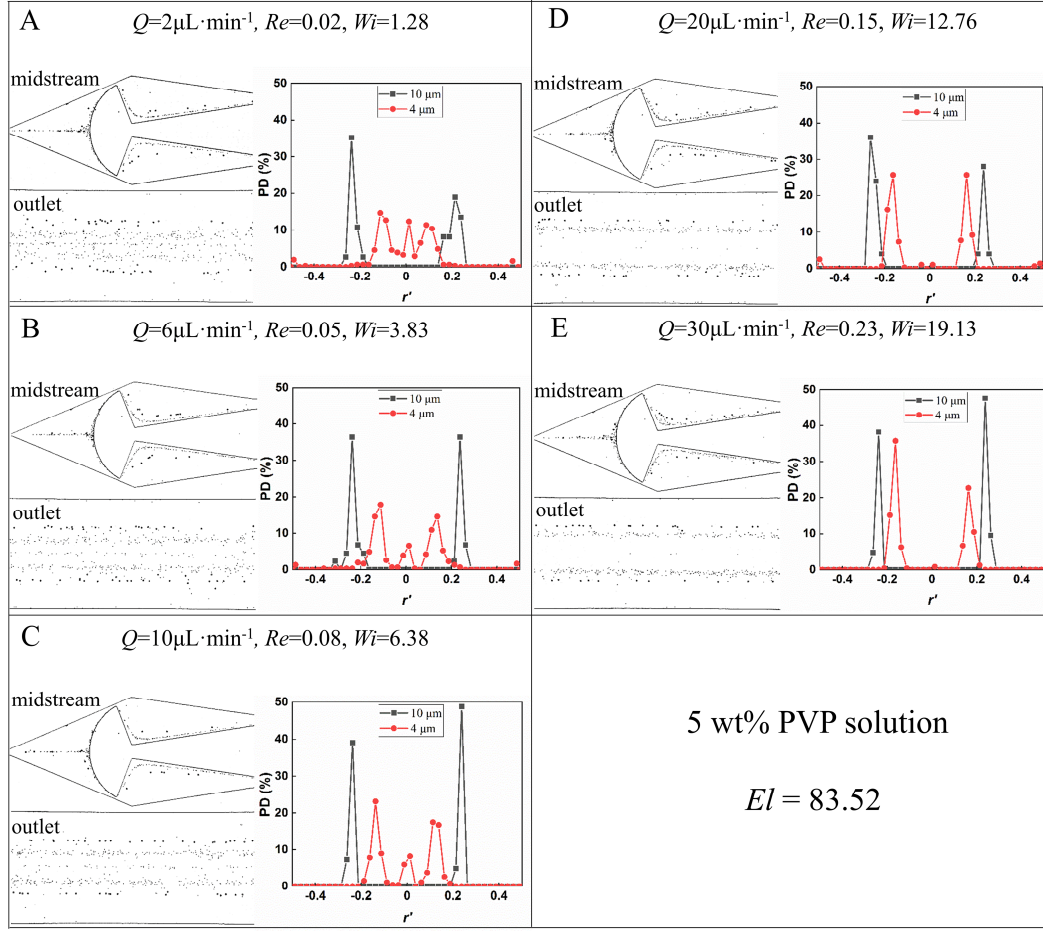


Figure S5. Experimental results of spherical particles of 4 μm and 10 μm in 5 wt% PVP solution ($El = 83.52$) at different flow rates.

Table S5. Separation efficiency and purity of 4 μm and 10 μm spherical particles in 5 wt%PVP solution ($El = 83.52$) at different flow rates.

Flow rate (μL/min)	Wi	Re	η (10 μm particle)	p (10 μm particle)	η (4 μm particle)	p (4 μm particle)
2	1.28	0.02	1.000	0.787	0.967	1.000
6	3.83	0.05	1.000	0.595	0.907	1.000
10	6.38	0.08	1.000	0.872	0.978	1.000
20	12.76	0.15	1.000	0.926	0.992	1.000
30	19.13	0.23	1.000	0.840	0.983	1.000

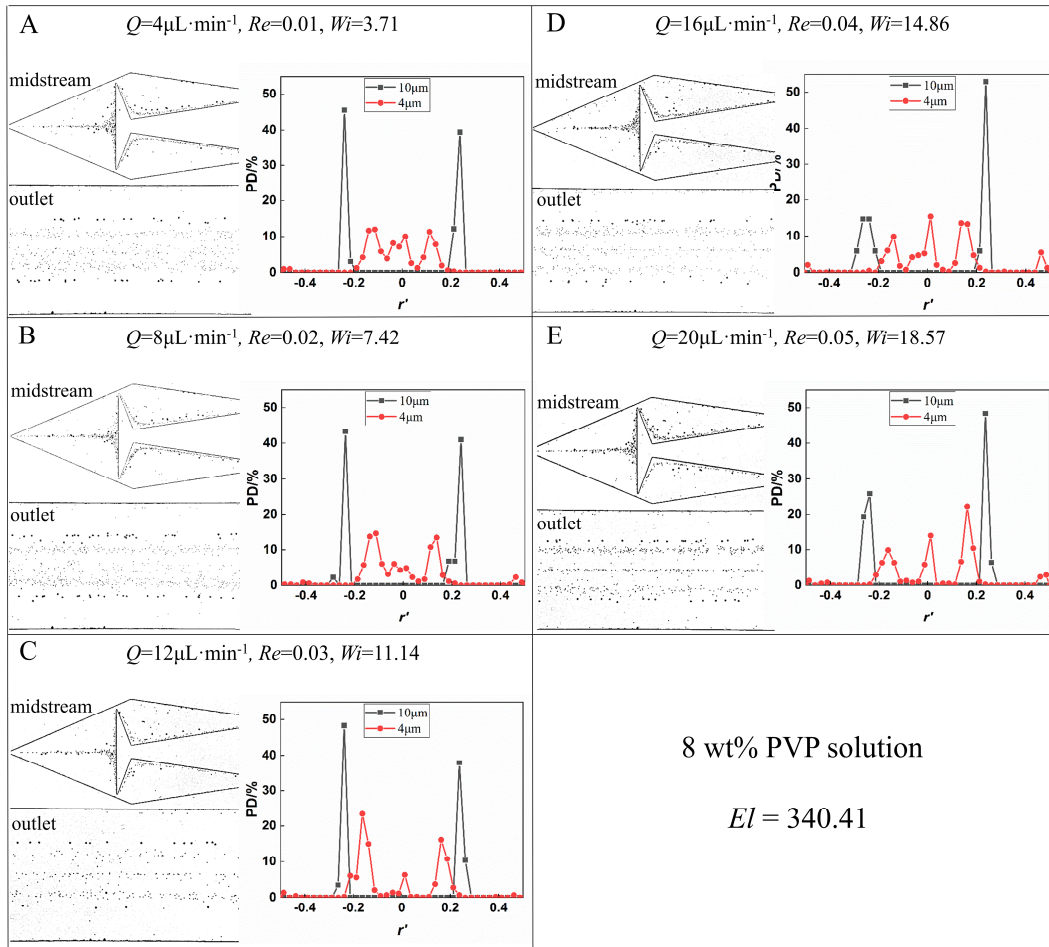


Figure S6. Distributions of $4\mu\text{m}$ and $10\mu\text{m}$ particles in the 8 wt% PVP solution ($El = 340.41$) at various flow rates (second-stage channel with plane geometric structure).

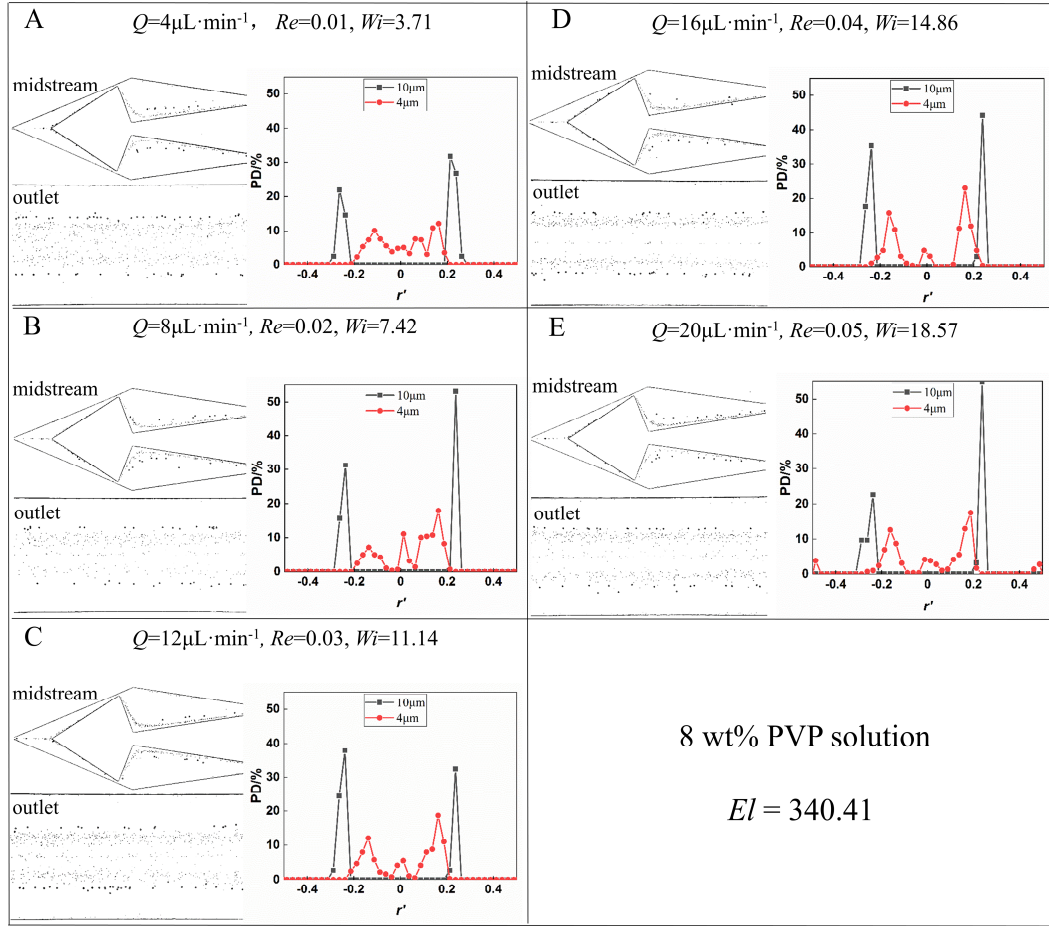


Figure S7. Distributions of $4\mu\text{m}$ and $10\mu\text{m}$ particles in the 8 wt% PVP solution ($El = 340.41$) at various flow rates (second-stage channel with sharp geometric structure).