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Supplementary Materials

Table S1. Microgels manufactured by internal gelation in microfluidic devices. ABIL EM 90: Silicone-based non-ionic W/O emulsifier from Evonik; AFFD: Axisymmetric flow-focusing device; BODIPY: a fluorescent dye; DMC: dimethyl carbonate; DMEM: Dulbecco's modified Eagle's medium; EDTA: Ethylenediaminetetraacetic acid; FA: ferulic acid; GDL: Glucono-1,5-lactone; MFFD: Microfluidic flow focusing device; Span 80: Sorbitan monooleate (Polysorbate 80); TAP: TRIS acetate phosphate; (d = diameter of beads, DP = dispersed phase, CP = continuous phase)

Microfluidic device	Microgels	W/O Emulsion formulation	Ref.
MFFD	Ca-alginate beads (d=60-110 μm)	DP: 2 wt% sodium alginate + 0.1 wt% $CaCO_3$ in water CP: 5wt% CH_3COOH + 3 wt% Span 80 in soybean oil	[1]
Microfluidic Y-junction	Ba-alginate beads (d=249-318 μm)	DP: 2 % (w/v) sodium alginate + 5-10 mM $BaCO_3$ in water CP: 0.15 vol% CH_3COOH in sunflower oil	[2]
T-junction	Ca-alginate beads (d=94-150 μm)	DP: 2 wt% sodium alginate + 1.14-2.27 mg/mL $CaCO_3$ in water CP: 0.67-2.68 μL/mL CH_3COOH + 2 wt% lecithin in corn oil	[3]
MFFD	Ca-alginate beads (d=10-50 μm)	DP: 2 wt% sodium alginate + 50 M Ca-EDTA in water CP: 0.05 vol% acetic acid + 1 wt% biocompatible surfactant in fluorinated carbon oil	[4]
Ψ-junction with wavy collection channel	Ca alginate beads loaded with fluorescent quantum dots (d=43-45 μm)	DP: Sodium alginate + $CaCO_3$ in water CP: acetic acid + ABIL EM 90 in hexadecane	[5]
3D microfluidic AFFD	Ca alginate beads containing *Chlamydomonas* (d=82-108 μm)	DP: 1 wt% sodium alginate + 150 mM GDL + $CaCO_3$ + *Chlamydomonas* in TAP buffer CP: 2 wt% lecithin in corn oil	[6]
MFFD	Ca pectin beads (d≈42 μm)	DP: 5-20 μg/μL Pectin + 2.5-10 μg/μL $CaCO_3$ in water CP1: Anhydrous DMC or DMC saturated with water CP2: 0.5 wt% acetic acid in DMC	[7]
MFFD with droplet trappers	Ca-alginate beads (d=100-200 μm)	DP: 1 wt% sodium alginate + 3 wt% $CaCO_3$ in blue dyed water CP1: 1-2 wt% Span 80 in light mineral oil CP2: 1 wt% acetic acid +1-2 wt% Span 80 in light mineral oil	[8]
Adhesive film-based microfluidic device	Ca-alginate beads (d≈90 μm)	DP: 1.5% (v/v) sodium alginate + 50 mM Ca-EDTA in water CP1: 1% (v/v) Tween 80 in mineral oil CP2: 1.4% (v/v) acetic acid + 1% (v/v) Tween 80 in mineral oil	[9]

Novel microfluidic flow-focusing shielded junction	Ca-alginate beads containing HEK293, U-2 OS and PC12 cells (d=75-100 μm)	DP: 2 wt% sodium alginate + 0. 5wt% $CaCO_3$ + 1×10^6 mL^{-1} cells in DMEM CP1: 0.3 vol% acetic acid in sunflower oil CP2: Pure sunflower oil	[10]
Upstream Y-junction combined with two downstream serial Ψ-junctions	FA-pectin/Bodipy-pectin Janus beads (d≈92 μm)	DP1: 2 wt% citrus FA-pectin +1 wt% $CaCO_3$ in water DP2: 2 wt% citrus Bodipy-pectin +1 wt% $CaCO_3$ in water CP: 0.5 wt% CH_3COOH+ 1 wt% Span 80 in sunflower oil	[11]
Upstream Y-junction combined with two downstream Ψ-junctions	FA-alginate/BODYPI-pectin Janus beads (d≈92 μm)	DP1: 2 wt% citrus BODYPI-pectin +1 wt% $CaCO_3$ in water DP2: 2 wt% sodium FA-alginate +1 wt% $CaCO_3$ in water CP: 0.5 wt% CH_3COOH + 1 wt% Span 80 in sunflower oil	[11]

Table S2. Microgels manufactured by external gelation in microfluidic devices. AFFD: axisymmetric flow focusing device; SY-Glyster CRS-75: Polyglycerol esters of fatty acids from Sakamoto Yakuhin Kogyo; DMC: dimethyl carbonate; DMEM: Dulbecco's modified Eagle's medium; HBSS: Hanks' balanced salt solution; α-MEM: Modification of Minimum Essential Medium that contains non-essential amino acids; MFFD: microfluidic flow focusing device; SAP: self-assembling peptide.

Microfluidic device	Microgels	Emulsion formulation	Ref.
MFFD	Ca-alginate beads (d=50-70 μm)	DP: 2 wt% sodium alginate in water CP: 2 wt% $Ca(CH_3COO)_2$ + 3 wt% Span 80 in soybean oil	[1]
MFFD	Ca-alginate beads containing PS particles (d=30-230 μm)	DP: 1-2 wt% sodium alginate + 2×10^6 mL^{-1} PS particles in water CP: 0.2-0.5 wt% CaJ_2 in undecanol	[12]
MFFD	κ-carrageenan beads (d≈50 μm)	DP: 0.8 wt% κ-carrageenan in water CP: 0.25 wt% CaJ_2 in undecanol	[12]
MFFD	Carboxymethylcellulose beads (d≈80 μm)	DP: 1 wt% carboxymethylcellulose in water CP: 0.25 wt% $Fe(NO_3)_3$ in undecanol	[12]
MFFD	Ca-pectate beads containing gold nanoparticles	DP: 0.33-0.66 wt% pectin + 5 nm gold nanoparticles in water CP: 1-10 wt% acetic acid + 0.05-2 wt% $CaCO_3$ in rapeseed oil	[13]
Cross junction	Ca-pectate beads (d=65-78 μm)	DP: 10 wt% pectin in water CP: 4M $CaCl_2$ emulsified and dehydrated + 2 wt% Span 80 in mineral oil	[14]
Cross junction	Ca-pectate beads containing Fe_2O_3 nanoparticles	DP: 5 wt% pectin + Fe_2O_3 nanoparticles in water CP: 4M $CaCl_2$ emulsified and dehydrated + 2 wt% Span 80 in mineral oil	[14]

MFFD	Ca-pectate beads (d≈42 μm)	DP: 5, 10, 20 μg/μL pectin in water CP: DMC saturated with 9 μg/μL $CaCl_2$ aqueous solution Gelation bath: 20 μg/μL $CaCl_2$ in water	[7]
MFFD	Ca-alginate beads	DP: 2 wt% sodium alginate in water CP: $CaCl_2$ nanoparticles + 2 wt% Span 80 in mineral oil	[15]
MFFD with droplet trappers and two parallel oil flows	PuraMatrix™ peptide beads (d=100-200μm)	DP: 0.25-0.5 wt% PuraMatrix™ SAPs in water with blue food colour CP1: 1-2 wt% Span 80 in light mineral oil CP2: 1 g/mL Sudan dye + 1-2 wt% Span 80 in light mineral oil	[8]
3D microfluidic AFFD	SAP hydrogel beads containing bovine artery endothelial cells (d=114-146 μm)	DP: 0.5 % (w/v) PuraMatrix™ SAP solution + cell suspension in 20% (w/v) sucrose solution (1:1 volume ratio) CP: 6.8 mg mL^{-1} fine DMEM powder + 2% (w/v) Span 80 in mineral oil	[16]
Two consecutive cross-junctions	Ca-alginate beads (d=176-201 μm)	DP: 3 wt% sodium alginate in water CP1: 60 mPa·s corn oil CP2: 30 wt% $CaCl_2$ solution + 0.1 wt% SY-Glyster CRS-75 in corn oil	[17]
Two consecutive cross-junctions	Ca alginate beads coated Fe_3O_4 nanoparticles	DP: 3 wt% sodium alginate in water CP1: 60 mPa·s corn oil CP2: 2wt% Fe_3O_4 nanoparticles dispersed in 30 wt% $CaCl_2$ solution + 0.1 wt% SY-Glyster CRS-75 in corn oil	[17]
Microfluidic manifold with a single pump	Ca alginate beads containing embryonic carcinoma cells (d≈130μm)	DP: 2 %(w/v) sodium alginate in DMEM containing cell suspension CP: calcified oleic acid obtained by removing alcohol from alcohol-oleic acid-$CaCl_2$ mixture	[18]
MFFD with a cell-scattering microencapsulation device	Ca alginate beads containing embryonic carcinoma cells (d≈90μm)	DP1: 3.6% (w/v) sodium alginate in α−MEM DP2: cell suspension in 1.8% (w/v) alginate solution CP: Calcified oleic acid	[19]
Microfluidic junction combined with cross junction	Ca-alginate/Matrigel composite beads containing human cervical carcinoma cells (d=250-270 μm)	DP1: 50% (v/v) Matrigel + 10^7 mL^{-1} human cervical carcinoma cells in DMEM DP2: 2 wt% sodium alginate in DMEM CP: 5 wt% Span 80 in mineral oil Gelation bath: 4 wt% $CaCl_2$ in DMEM	[20]

X-junction 3D flow focusing chip	Polydisperse Ca-alginate beads	DP: 2 wt% sodium alginate in water CP: 1 wt% Span 80 in calcified oleic acid	[18]

Table S3. Microgels manufactured by in-drop mixing in microfluidic devices.

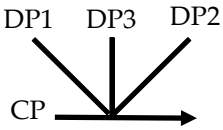
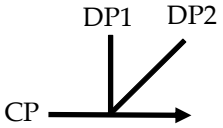
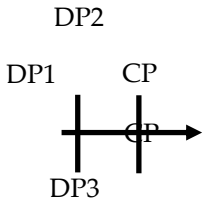
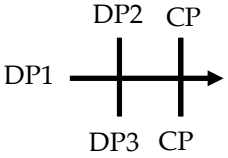
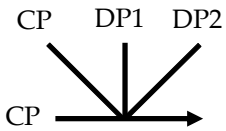
Microfluidic device	Microgels	Emulsion formulation	Ref.
	Calcium alginate beads containing yeast cells (d=60-95μm)	DP1: 1 wt% sodium alginate in water DP2: 30 mM $CaCl_2$ in water DP3: yeast cells in a buffer solution CP: 1 wt% Span 80 in hexadecane	[21]
	Calcium alginate beads	DP1: 172 mM GDL in water DP2: 0.9 wt% sodium alginate + 22 mM $CaCO_3$ particles (dp<5 μm) in water CP: Sunflower oil	[22]
	Calcium alginate beads (d=50-300μm)	DP1: Deionised water DP2: 2 wt% sodium alginate in water DP3: 2 wt% $CaCl_2$ in water CP: Octyl alcohol	[23]
	Calcium alginate beads	DP1: Deionised water DP2: 0.2-2.0 wt% sodium alginate in water DP3: 0.2-2.0 wt% $CaCl_2$ in water CP: 3wt% fluorosurfactant in Fluorinert™ FC-40 fluorocarbon oil	[24]
	Calcium alginate beads containing LCC6/Her-2 breast tumor cells	DP1: 2wt% sodium alginate + 1×10^7 of cells mL^{-1} + 50 mM tris-HCl in DMEM DP2: 40 mM $CaCl_2$ in 50 mM tris-HCl at pH 7.8 CP: 2% Span 80 in n-hexadecane	[25]

Table S4. Microgels manufactured by droplet merging in microfluidic devices. GOx: glucose oxidase; HEPES: (4-(2-hydroxyethyl)-1-piperazineethanesulfonic acid); HepG2, human liver cancer cell line; HRP: horseradish peroxidase; MEL: mouse erythroleukemia; MFFD: microfluidic flow focusing device.

Microfluidic device	Microgels	Emulsion formulation	Ref.
Microfluidic cross junction	PuraMatrix™ beads containing HepG2 cells (d=40-100 μm)	DP1: 2% Puramatrix in water DP2: HepG2 cells in cell media CP: 0.5 wt% Span 80 in mineral oil	[26]

Microfluidic cross junction	Calcium alginate beads containing glucose oxidase assay (d=40-100 μm)	DP1: 2 (w/v)% alginic acid + 2 U/mL GOx + 0.2 U/mL HRP + 100 μM Amplex Red in water DP2: 0.5 mM $CaCl_2$ in water CP: 0.5 wt% Span 80 in mineral oil	[26]
MFFD with fusion chambers	Disk-like, plug-like and spherical calcium alginate beads (d=20-50 μm)	DP1: sodium alginate in water DP2: $CaCl_2$ in water CP: Soybean oil	[27]
Microfluidic Ψ-junction	Calcium alginate beads and fibres containing living cells (d=50-200 μm)	DP1: 0.5-1% sodium alginate + 3T3 and L929 fibroblast cells in water DP2: 0.13 M $CaCl_2$ in water CP: Soybean oil	[28]
MFFD with fusion chamber	Ca-alginate/magnetic Janus particles (d=48-62 μm)	DP1: 2.67 wt% sodium alginate + 2.13×10^{11} mL^{-1} magnetic NPs in water DP2: 2 wt% sodium alginate in water DP3: 1 wt% $CaCl_2$ in water CP: Soybean oil	[29]
Straight through silicon micronozzles	Calcium alginate beads containing living cells (d=50-200 μm)	DP1: 1.5% sodium alginate + 1×10^7 cells/ml in HEPES buffer solution DP2: 0.1M $CaCl_2$ + 0.14 M NaCl in water CP: Soybean oil	[30]
Microfluidic Y-junction with a nozzle	Calcium alginate beads containing MEL cells (d=104-167 μm)	DP1: 1.5 wt% sodium alginate + 1×10^5 mL^{-1} cells in HEPES buffer solution DP2: 0.1M $CaCl_2$ solution CP: Edible oil	[31]
MFFD with two expansion chambers and a serpentine channel	Calcium alginate beads with Fe_3O_4 nanoparticles containing cancer HCT116 cells (d=21 μm)	DP1: 2 wt% sodium alginate + Fe_3O_4 nanoparticles (250 nm) + 1×10^5 mL^{-1} HCT116 cells in water DP2: 1 wt% $CaCl_2$ in water CP: soybean oil stained with oil-soluble dye Sudan III	[32]
X- and T-junction droplet chip	Multi-compartment network of Ca alginate	DP1: 2wt% sodium alginate in water CP1: 1 wt% Span 80 in oleic acid CP2: 1 wt% $CaCl_2$	[33]

Table S5. Microgels manufactured by enzymatic crosslinking in microfluidic devices. CF-KRH: calcium-free Krebs Ringer Hepes buffered solution; CRFK: Crandall-Reese feline kidney cells; FBS: fetal bovine serum; hMSCs: human mesenchymal stem cells; HRP: Horseradish Peroxidase; PBS: Phosphate-buffered saline; MIN6-B1: mouse insulinoma cell.

Microfluidic device	Microgels	Emulsion formulation	Ref.
Microfluidic co-flow device	Alginate-tyramine beads containing cells (d=80-280 μm)	DP: 1.5 %(w/v) Alginate-tyramine + 1.6 U/mL HRP + 1.5×10^{7} mL^{-1} CRFK cells in CF-KRH. CP: 0.82 mM H_2O_2 + 3 wt% lecithin in liquid paraffin	[34]
Microfluidic glass capillary device	Dextran-tyramine beads containing hMSCs (d=80-300 μm)	DP1: 2.5, 5, 10 % (w/v) Dextran-tyramine + 250 U/mL HRP + 2×10^{7} mL^{-1} hMSCs cells in DMEM/FBS mixture CP: 1% (w/v) Span 80 in n-hexadecane H_2O_2 bath: 10%, 20%, 30% H_2O_2 solution	[35]
Microfluidic flow-focusing device	Dextran-Tyramine conjugates beads containing MIN6-B1 cells	DP: 5% (w/v) Dextran-tyramine conjugates + 22 U/mL HRP + 83000 U/mL catalase + 7.5×10^{7} cells/mL MIN6-B1 cells in PBS buffer CP: 1% (w/v) Span 80 in hexadecane+30% (w/v) H_2O_2	[36]
Flow-focusing device with 3 converging inlet channels	Dex-TA beads containing MSCs	DP1: 10% (w/v) Dextran-tyramine + 1×10^{7} cells/mL MSCs in PBS buffer DP2: 44 U/ml HRP + 8% (w/v) iodixanol in PBS buffer DP3: 5×10^{-6} M H_2O_2 CP: 2% biocompatible surfactant in fluorocarbon oil	[37]
Microfluidic flow-focusing device	Dex-HA-TA beads containing MSCs	DP1: 5-10% (w/v) Dex-tyramine + 5% (w/v) hyaluronic acid-tyramine + 1×10^{7} cells/mL MSCs in PBS buffer DP2: 44 U/ml HRP + 8% (w/v) iodixanol in PBS buffer DP3: 5×10^{-6} M H_2O_2 CP: 2% biocompatible surfactant in fluorocarbon oil	[37]

Table S6. Microgels manufactured by photo-crosslinking n in microfluidic devices. ABIL® EM 90: Cetyl PEG/PPG-10/1 dimethicone; Dex-HEMA: Dextran-hydroxyethyl methacrylate; DMMI: dimethylmaleimide; GelMA: Gelatin-methacryloyl; Igepal: octylyphen oxypolyethoxyethanol; Irgacure 2959: 2-Hydroxy-4′-(2-hydroxyethoxy)-2-methylpropiophenone; PEGDA: Poly(ethylene glycol diacrylate); PEGMA: Poly(ethylene glycol methyl ether acrylate); NIPAAm: N-isopropylacrylamide; QD: quantum dot; TEMED: tetramethyl ethylenediamine; TXS: thioxanthone-2,7-disulfonate.

Microfluidic device	Microgels	Emulsion formulation	Ref.
Flow focusing PDMS device	Dex-HEMA beads (d=10 μm)	DP: 30 wt% dex-HEMA (pre-polymer) + Irgacure 2959 in water CP: 4 vol% ABIL® EM 90 in mineral oil	[38]
Flow-focusing device	GelMA beads (d=35-150 μm)	DP: 8 wt% GelMA + 0.2 wt% Irgacure 2959 in PBS at pH 7.4 CP: 20 wt% Span 80 in mineral oil	[39]
Microfluidic flow-focusing device	pNIPPAm beads (d=60-150μm)	DP:50 g/L P(NIPAAm-DMMI) + 0.5 mmol/L TXS CP: 2 wt% ABIL® EM 90 in paraffin oil	[40]
MFFD with wavy downstream channel	QD-encoded PEGDA beads (d=10 μm, 18 μm, 39 μm)	DP: 5 mg/mL Irgacure 2959 + QDs in PEGDA CP: 4wt% ABIL® EM 90 in hexadecane	[41]
MFFD with wavy downstream channel	PEGDA beads	DP: 0.1 mg/mL Rhodamine B + 1% (w/v) Irgacure 2959 + 25%, 50%, or 100% (w/v) PEGDA in water CP: 1% (w/v) TEMED + ABIL® EM 180 in mineral oil	[42]
MFFD with wavy downstream channel	PEGMA or PEGDA beads (d=40-200 μm)	DP: 20, 40 or 60 wt% PEGMA or PEGDA + 3 wt% Irgacure 2959 + 1wt% Igepal + 10 mM rhodamine B CP: Mineral oil	[43]

Table S7. Core-shell microgels manufactured by external gelation in microfluidic devices. PGPR 90: Polyglycerol polyricinoleate; Tween 20: Polysorbate 20.

Microfluidic device	Microgels	Emulsion formulation	Ref.
Three-phase glass capillary device	Gellan gum shell with a sunflower oil core (d=95-260 μm)	O_1: Sunflower oil labelled with an orange dye W: 0.5 wt% gellan gum + 2 wt% Tween 20 in water O_2: 1 wt% calcium acetate + 5 wt% PGPR 90 in sunflower oil	[44]
Co-flow glass capillary device	Alginate shell with a soybean oil core (d=250-255 μm)	O_1: 8%(w/v) PGPR 90 in soybean oil W_1: 2% (w/v) sodium alginate in water O_2: 8 % (w/v) PGPR 90 in soybean oil W_2: 10 % (w/v) $CaCl_2$ in water	[45]

Table S8. Core-shell microgels manufactured by internal gelation of charged polymers in microfluidic devices: DMEM: Dulbecco's Modified Eagle Medium; EDTA: Ethylenediaminetetraacetic acid; HepG2: human hepatocellular carcinoma cells; HFE-7500; fluorinated oil; LR300: Lumogen® F Red 300; PAG: photo-acid generator (diphenyl iodonium nitrate); PFPE / PEG: perfluoropolyether / poly(ethylene glycol); PGPR 90: Polyglycerol polyricinoleate.

Microfluidic device	Microgels	Emulsion formulation	Ref.
Co-flow glass capillary device	Alginate shell with a single or multiple/distinct oil cores	$\underline{O_1}$: 2% (v/w) PGPR 90 + 33% (v/v) thyme or lavender essential oil in a 1:1 (v/v) soybean oil/ benzyl benzoate mixture $\underline{W}$: 0.5-2.5 % (w/v) sodium alginate + 0.5% (w/v) Pluronic F-127+ 0.1 mM Ca-EDTA $\underline{O_2}$: 5% (w/v) PGPR 90 + in soybean oil $\underline{\text{Gelation bath}}$: 5% (w/v) acetic acid + 5% (w/v) PGPR 90 in soybean oil	[46]
Co-flow glass capillary device	Alginate shell with a soybean oil core	$\underline{O_1}$: LR300 in a 1:1 (v/v) soybean oil/ benzyl benzoate mixture $\underline{W}$: 2 wt% sodium alginate + 0.15 (w/v) $CaCO_3$ nanoparticles + 30 mM PAG +1 wt% Pluronic F127 in water $\underline{O_2}$: 8% (w/v) PGPR 90 in soybean oil	[47]
Microfluidic flow-focusing device	Alginate shell with aqueous core containing HepG2 cells	$\underline{W_1}$: 1×10^8 HepG2 cells/mL in DMEM $\underline{W_2}$: 100 mM Ca-EDTA + 1.7% (w/v) alginate in water $\underline{O_1}$: 1% (w/v) PFPE/PEG in HFE-7500 $\underline{O_2}$: 1% (w/v) PFPE/PEG +0.15% (w/v) acetic acid in HFE-7500	[48]

Table S9. Core-shell microgels manufactured by photo-crosslinking in microfluidic devices. ABIL® EM 90: Cetyl PEG/PPG-10/1 dimethicone; DEX-GPE: glycidyl propargyl ether derivatized dextran: DEX-SH: thiol derivatized dextran; GelMA: Gelatin-methacryloyl; MC: Methyl cellulose; PNIPAAm: poly(N-isopropylacrylamide); PAAm: Poly(acrylamide); PEG: Polyethylene glycol; PGPR: Polyglycerol polyricinoleate; TXS: thioxanthone-2,7-disulfonate.

Microfluidic device	Microgels	Emulsion formulation	Ref.
3D PDMS MFFD with two cross junctions	Dextran shell with a PEG core (d=130-230 μm)	$\underline{\text{Inner}}$: 10 wt% PEG + 3 mg/mL Irgacure 2959 in water $\underline{\text{Middle}}$: 5 wt% DEX-GPE + 5 wt% DEX-SH + 3 mg/mL Irgacure 2959 in water $\underline{\text{Outer}}$: 40 wt% PEG + 5 mg/mL Irgacure 2959 in water	[49]
MFFD with two cross junctions	GelMA shell with a methyl cellulose core (d=279-367 μm)	$\underline{\text{Inner}}$: 1 wt% MC in water $\underline{\text{Middle}}$: 8 wt% GelMA + 0.5 wt% Irgacure 2959 in water $\underline{\text{Outer}}$: 2 wt% Span 80 in mineral oil	[50]
MFFD with two cross junctions	p(NIPAAm) shell with a PAAm core (d≈120 μm)	$\underline{\text{Inner}}$: pNIPAAm beads dispersed in water $\underline{\text{Middle}}$: 35g/L P(NIPAAm-DMMI) + 15 g/L green-tagged P(NIPAAm-DMMI) + 0.5 mM TXS in water $\underline{\text{Outer}}$: 2wt% ABIL® EM 90 in paraffin oil	[51]

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