

Supporting Information

Enhanced oxygen mass transfer in mixing bioreactor using silica microparticles

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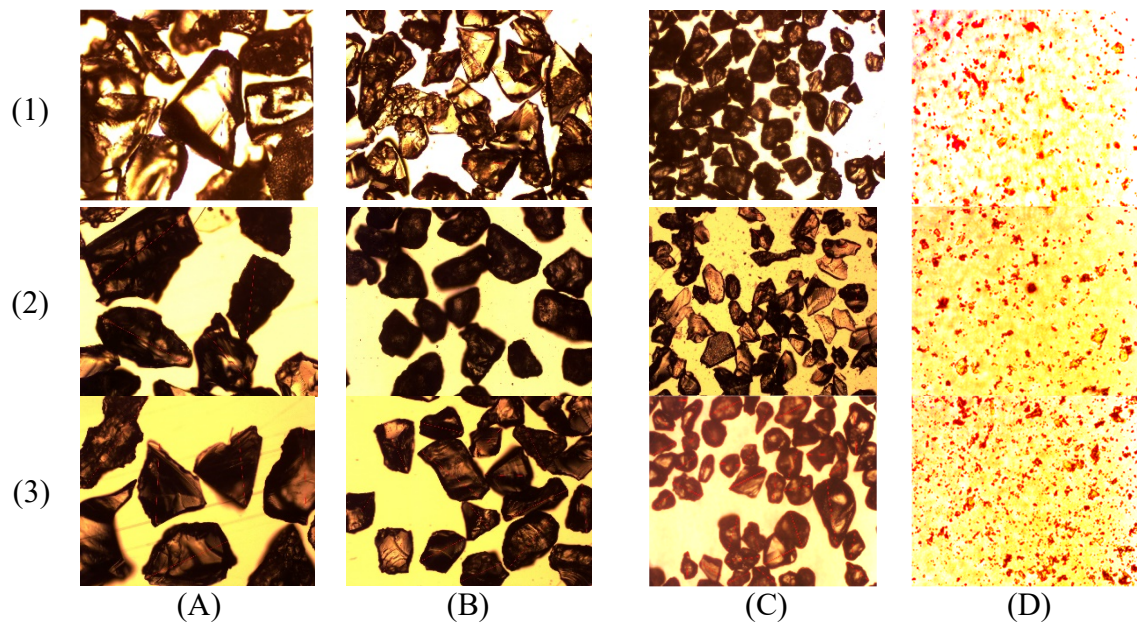


Figure S1. Microscopy image of sol-gel silica (1), commercial sand (2) and treated beach sand (3). (A) 350 μm , (B) 150 μm , (C) 75 μm e (D) 10 μm

Table S1. X-ray diffraction analysis of silica microparticles

Samples	Displacement (2 θ)	Scale Factor	Score	Chemical Formule	Name
Commercial silica	0.001	0.805	74	SiO ₂	Silicon dioxide
Sol-gel silica	0.057	1.048	87	SiO ₂	Silicon dioxide
Pre-treatment beach sand	0.180	0.006	13	CaCO ₃	Calcite
	0.119	0.002	18	NaCl	Halite
	0.061	0.793	70	SiO ₂	Silicon dioxide
	0.038	0.021	7	Mg ₂ Al ₄ Si ₅ O ₁₈	Cordierite
	-0.025	0.003	10	Na ₈ Mg ₃ Si ₉ O ₂₄ (OH) ₂	Sodalite
	-0.370	0.008	9	CaF ₂	Fluorite
Pos-treatment beach sand	0.057	1.048	87	SiO ₂	Silicon dioxide

Table S2. Influence of agitation on the oxygen mass transfer (k_{La}) using aeration of 1.5 L min^{-1} at 25°C .

Agitation (rpm)	K_{La} (h^{-1})
50	4.15
100	8.32
150	12.0
200	14.91

Table S3. Influence of agitation on the oxygen mass transfer (k_{La}) using aeration of 1.5 L min^{-1} at 25°C .

Aeration (L min^{-1})	K_{La} (h^{-1})
0.5	3.96
1.5	8.32
3.0	11.22
4.5	13.41
6.0	14.44

Table S4. Effect of particle size (1 g L^{-1}) on the oxygen mass transfer (k_{La}) using an agitation of 100 rpm aeration of 3.0 L min^{-1} and at 25°C .

Particle Size(μm)	Silica sol-Gel	Commercial sand	Sand beach treated
0 (without)	11.21	11.21	11.21
10	12.80	21.68	13.66
75	27.02	21.95	19.35
150	18.75	19.29	16.63
350	16.26	16.69	15.64

Table S5. Effect of particle concentration with $75 \mu\text{m}$ on the oxygen mass transfer (k_{La}) using an agitation of 100 rpm aeration of 3.0 L min^{-1} and at 25°C .

Particle Concentration (μm)	Silica sol-Gel	Commercial sand	Sand beach treated
0.00	11.21	11.21	11.21
0.05	11.52	13.95	11.64
0.15	11.71	15.21	11.83
0.25	12.80	16.55	13.66
0.50	12.92	16.32	14.89
1.00	27.02	16.55	16.31
2.00	17.54	21.95	19.35
2.50	13.27	15.69	12.35
5.00	5.79	9.06	9.89