

Supporting Information

Enhancement of menaquinone-7 production through immobilization with hydrogel-based porous membranes

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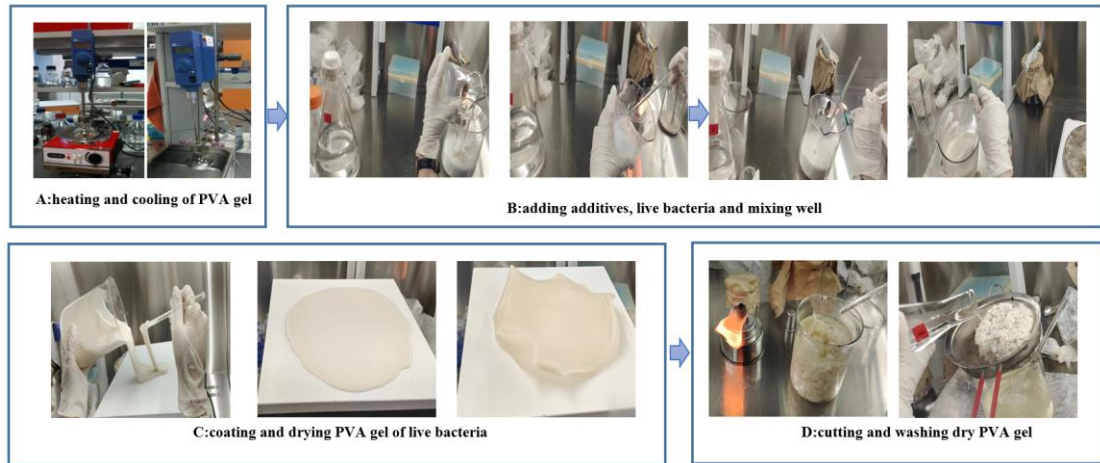


Figure. S1 The flowchart for the immobilization process.

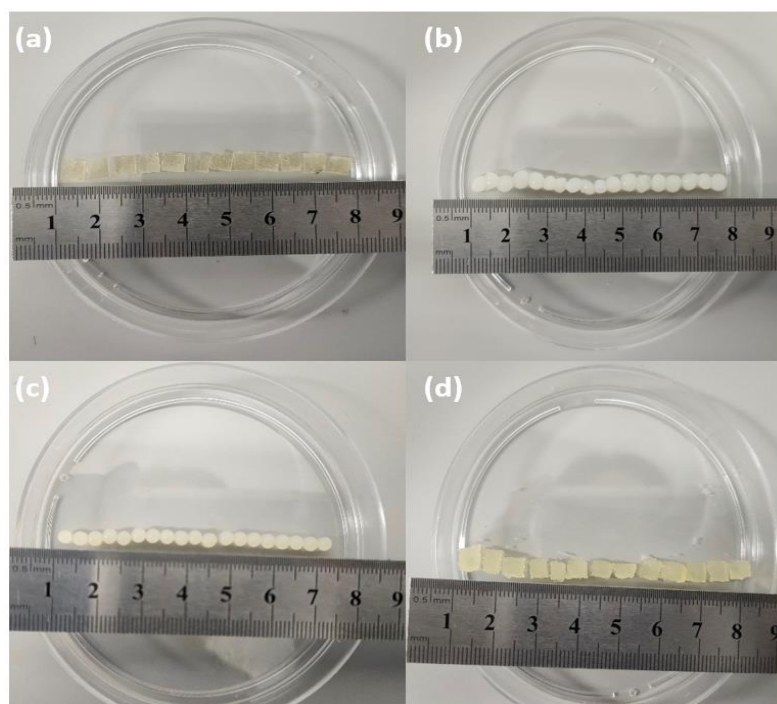


Figure. S2 Immobilized cells with different ma: Poly viny alcohol (a); Chitosan (b); Alginate (c); Gelatin (d).

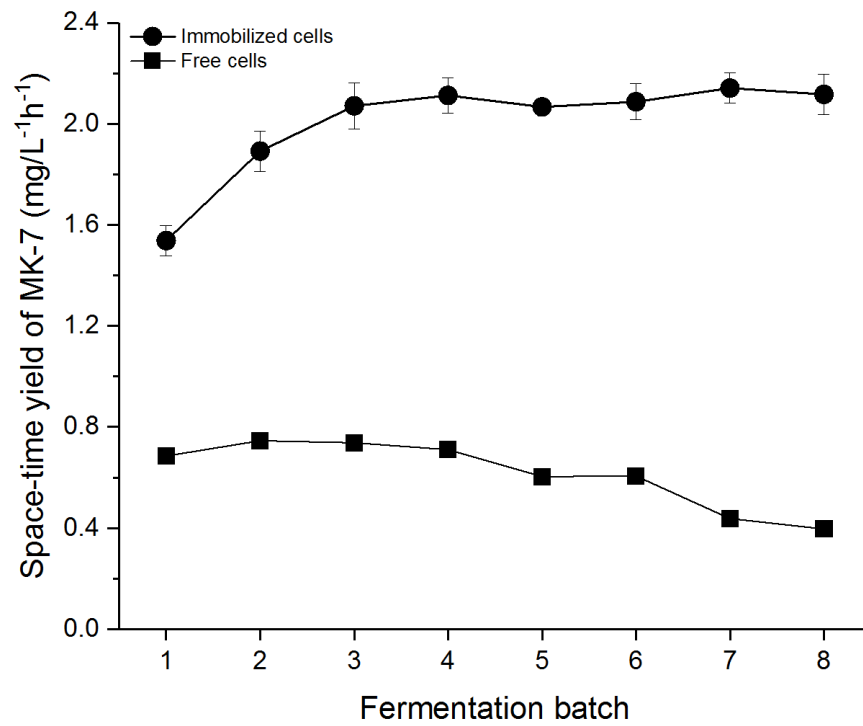


Figure. S3 Comparison of the space-time yields of MK-7 using free cells (square symbol) and immobilized cells (circle symbol) in continuous fermentation processes.

Table S1. MK-7 production, final OD₆₀₀, maximal specific growth rate (μ_{\max}) and maximal glycerol consumption rate ($q_{s,\max}$) of *Bacillus subtilis* BUCT-184 strains during cultivation in 5L bioreactor.

Cells	Final OD ₆₀₀	μ_{\max} (h ⁻¹) ^a	$q_{s,\max}$ (mg OD ₆₀₀ ⁻¹ h ⁻¹)	MK-7 yield (μg(g DCW) ⁻¹)	Specific activity of menA ^b
Immobilized cells	16.77±0.55	1.45±0.15	32.2±3.2	161.1±8.2	0.67±0.12
Free cells	18.78±0.59	0.73±0.09	23.1±1.2	109.2±13.3	0.65±0.24

a, ΔOD₆₀₀ per units of bacteria per hour.

b, the unit of specific activity is nanomoles per hour per milligram of protein.