

Efficient immobilisation of industrial biocatalysts: criteria and constraints for the selection of organic polymeric carriers and immobilisation methods

Sara Cantone,^a Valerio Ferrario,^b Livia Corici,^a Cynthia Ebert,^b Diana Fattor,^a Patrizia Spizzo,^a and Lucia Gardossi^{*b}

^a SPRIN s.p.a. c/o BIC Incubatori FVG, Via Flavia 23/1, 34148, Trieste (TS), Italy

^b Laboratory of Applied and Computational Biocatalysis, Department of Scienze Chimiche e Farmaceutiche, Università degli Studi di Trieste, Piazzale Europa 1, 34127, Trieste (TS), Italy

* gardossi@units.it

Table S1: Synthetic organic polymers employed for enzyme adsorption and available on the market. Legend: a) Resindion S.r.l. (Mitsubishi Chemical Corporation); b) Lanxess; c) Rohm and Haas Company; d) Purolite International Ltd; e) ChiralVision; f) Degussa Röhm GmbH & Co. KG; g) Membrana GmbH; h) SPRIN S.p.A.

Product Name	Chemical Matrix	Functional group	Surface area (m ² /g)	Pore volume (ml/g)	Pore diameter (Å)
^a Sepabeads EC-OD/S	polyacrylic	octadecyl			100-200
^a ReliZyme OD403	polyacrylic	octadecyl			400-600
^a Sepabeads EC-BU/S	poly(methacrylate)	butyl			100-200
^a ReliZyme BU403	poly(methacrylate)	butyl			400-600
^a Sepabeads EC-OC/S	poly(methacrylate)	octyl			100-200
^a ReliZyme OC403	poly(methacrylate)	octyl			400-600
^b Lewatit VP OC 1600	poly(methyl methacrylate-divinylbenzene)	-	130	0.5	150
^c Amberlite XAD 118 ON	poly(styrene-divinylbenzene)	-	≥ 450	≥1.4	400-450
^c Amberlite XAD-7	polyacrylic	-	≥ 380	0.65	N/A
^d ECR8806 Octadecyl acrylate	polyacrylic	octadecyl	> 80	N/A	500-700
^d ECR1811 Octadecyl styrene	polystyrene	octadecyl	> 200	N/A	1000-1200
^d ECR1090 Macroporous styrene	polystyrene	-	> 750	N/A	900-1100
^e IB-EC1	polyacrylic	-	N/A	N/A	N/A
^e IB-S861	polystyrene	-	N/A	N/A	N/A
^e IB-S500	polypropylene	-	N/A	N/A	N/A
^f Eudragit S-100	poly(methacrylate)	-	N/A	N/A	N/A

^g Accurel MP1000	polypropylene	-	80-100	N/A	50-500
^h SPRINbeads SN110	poly(styrene-divinylbenzene)	-	590	1.3	400-600
^h SPRINbeads AO110	polyacrylic	octadecyl	60-80	0.2-0.4	100-200
^h SPRINbeads AN110	polyacrylic	-	120-140	0.4-0.6	150-200

Table S2: A number of synthetic organic polymers employed for ionic immobilisation available on the market. Legend: a) Resindion S.r.l. (Mitsubishi Chemical Corporation); b) ChiralVision

Product Name	Chemical Matrix	Functional group	Pore diameter (Å)
^a Sepabeads EC-EA	poly(methacrylate)	ethylamino	100-200
^a Sepabeads EC-HA	poly(methacrylate)	hexamethylamino	100-200
^b IB-D152	polyacrylic	carboxylic acid	N/A
^b IB-C435	polyacrylic	carboxylic acid	N/A
^b IB-A161	polystyrene	quaternary ammonium	N/A
^b IB-A171	polystyrene	quaternary ammonium	N/A
^b IB-A369	polystyrene	quaternary ammonium	N/A

Table S3: Organic synthetic polymers available for covalent immobilisation. Legend: a) Resindion S.r.l. (Mitsubishi Chemical Corporation); b) ChiralVision; c) Fermenta Biotech Ltd.; d) Purolite International Ltd; e) Degussa Röhm GmbH & Co. KG; f) SPRIN S.p.a.

Product Name	Chemical Matrix	Functional group	Surface area (m ² /g)	Pore volume (ml/g)	Pore diameter (Å)
^a Sepabeads EC-EP	polyacrylic	epoxy	N/A	N/A	100-200
^a Relizyme EP403	polyacrylic	epoxy	N/A	N/A	400-600
^a Sepabeads EC-EA	polyacrylic	amino - short spacer	N/A	N/A	100-200
^a Relizyme EA403	polyacrylic	amino - short spacer	N/A	N/A	400-600
^a Sepabeads EC-HA	polyacrylic	amino - long spacer	N/A	N/A	100-200
^a Relizyme HA403	polyacrylic	amino - long spacer	N/A	N/A	400-600
^a Sepabeads	polyacrylic	epoxy-	N/A	N/A	100-200

EC-HFA		amino			
^a Relizyme HFA403	polyacrylic	epoxy- amino	N/A	N/A	N/A
^b IB150	polyacrylic	epoxy	N/A	3.0	N/A
^c Dilbeads-TA	polyacrylic	epoxy	N/A	3.0	N/A
^d ECR8205 Epoxy acrylate	polyacrylic	epoxy	>80	N/A	450-600
^d ECR8214 Epoxy acrylate	polyacrylic	epoxy	>60	N/A	1200-1800
^d ECR4204 Epoxy acrylic/styrene	acrylic/styrene	epoxy	>140	N/A	275-450
^d ECR8310 Amino C2 acrylate	polyacrylic	amino (short spacer)	>70	N/A	850-1200
^d ECR8319 Amino C2 acrylate	polyacrylic	amino (short spacer)	>50	N/A	1600-2000
^d ECR8405 Amino C6 acrylate	polyacrylic	amino (long spacer)	>40	N/A	450-850
^d ECR8417 Amino C6 acrylate	polyacrylic	amino (long spacer)	>50	N/A	1600-2200
^e Eupergit C	polyacrylic	epoxy			
^f SPRINbeads AH130	polyacrylic	amino (long spacer)	40-60	0.6-0.8	400-600
^f SPRINbeads AH110	polyacrylic	amino (long spacer)	60-80	0.2-0.4	100-200
^f SPRINbeads AA130	polyacrylic	amino (short spacer)	40-60	0.6-0.8	400-600
^f SPRINbeads AA110	polyacrylic	amino (short spacer)	60-80	0.2-0.4	100-200
^f SPRINbeads AE130	polyacrylic	epoxy	40-60	0.6-0.8	400-600
^f SPRINbeads AE110	Polyacrylic	epoxy	60-80	0.2-0.4	100-200