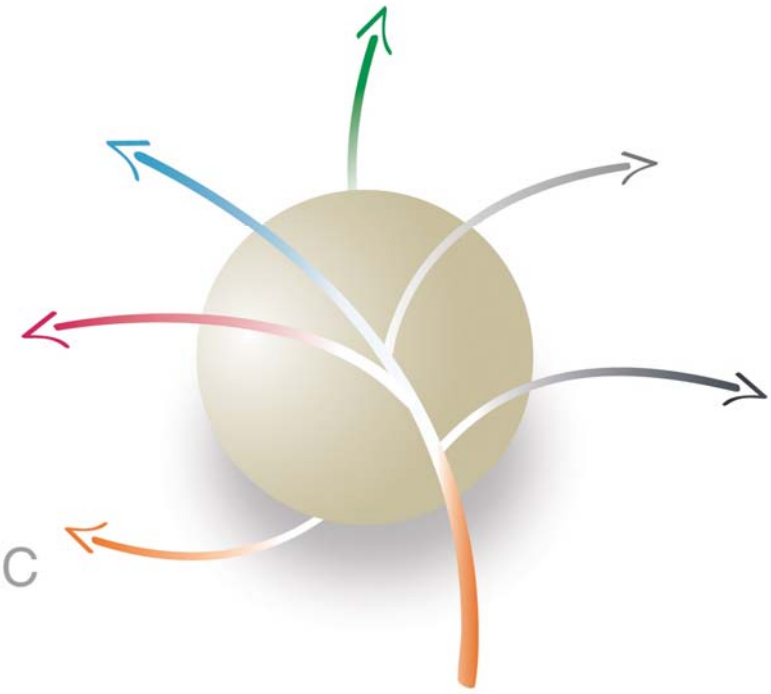
ReliZyme™ and SEPABEADS® EC



ReliZyme™
SEPABEADS® EC
Enzyme carriers

Resindion S.r.l.
A Subsidiary of MITSUBISHI CHEMICAL

CONTENT

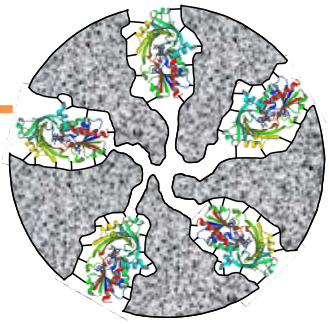
Introduction

Resindion S.R.L., a Subsidiary of Mitsubishi Chemical Corporation, is glad to introduce the new enzyme carriers line named **ReliZyme™** as an improvement of the consolidated industrial line of **SEPABEADS® EC**.

Technical Information

ReliZyme™ and **SEPABEADS® EC** are composed by a rigid methacrylic polymer matrix with different porosity degrees:

SEPABEADS® EC	ReliZyme™
Average pore diameter: 10 ÷ 20 nm	**Average pore diameter: 40 ÷ 60 nm**

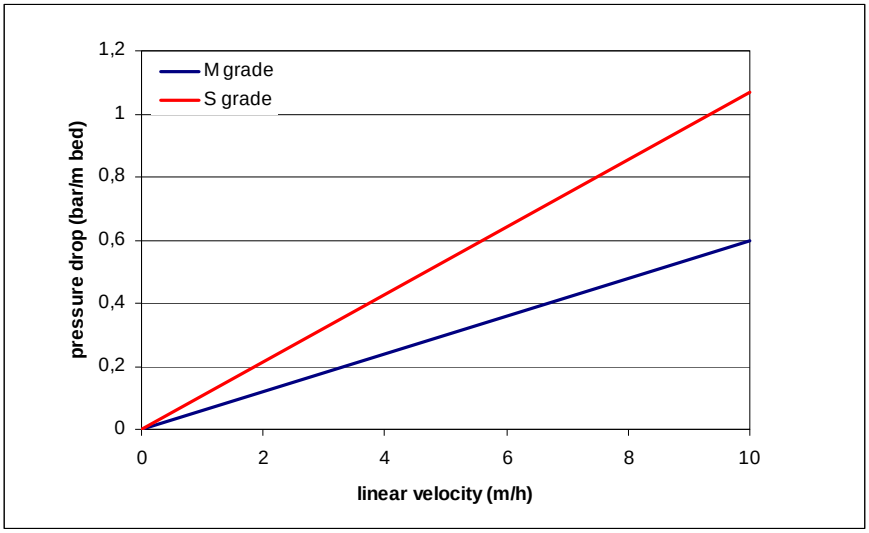


ReliZyme™ and SEPABEADS® EC characteristics:

- High physical and chemical stability;
- Low swelling tendency in high molar solutions and in common solvents;
- Outstanding mechano-osmotic resistance given by intense crosslinking.

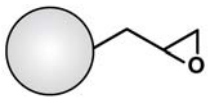
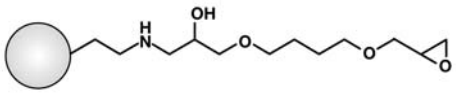
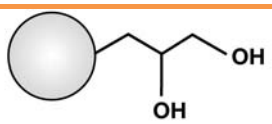
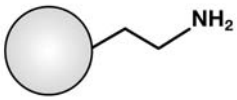
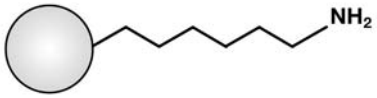
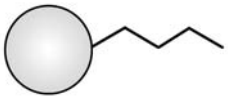
	Particle size range (µm)	
	S grade	**M grade**
ReliZyme™	100 - 300	200 - 500
SEPABEADS® EC	100 - 300	200 - 500

Pressure drop in water at 25°C



Thanks to the perfect spherical form of ReliZyme™ and SEPABEADS® EC and to the narrow particle size distribution range, the pressure drop produced by a resin bed is very low, as shown in the graph.
This property confers excellent filtration characteristics in CSTR (Continuous Stirred-Tank Reactor).

Products Line

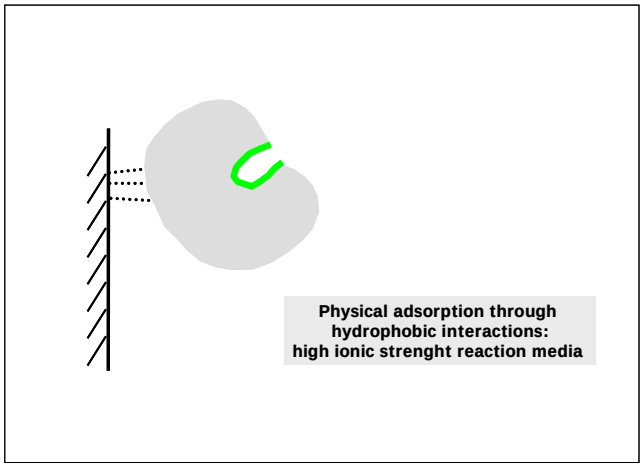
ReliZyme™	Functional Group	SEPABEADS® EC
EP403	 Epoxy	EC-EP
HFA403	 Amino-Epoxy	EC-HFA
HG403	 1,2-Diol	EC-HG
EA403	 Ethylamino	EC-EA
HA403	 Hexamethylamino	EC-HA
BU403	 Butyl	EC-BU
OC403	 Octyl	EC-OC
OD403	 Octadecyl	EC-OD

Immobilization mechanisms

The enzyme can be immobilized through several methods such as:

a. INTERACTION WITH THE CARRIER	- Adsorption
	- Ionic interaction
b. CHEMICAL BINDING	- Covalent binding with functional group
	- Cross-linking

a. Interaction with the carrier



The enzyme is adsorbed on the carrier at suitable conditions (e.g. pH, salt content) for the interaction with the functional groups distributed on the carrier surface. The interaction is reversible and the enzyme can be de-adsorbed changing the conditions. In some cases the adsorption can be quite strong (e.g. hydrophobic interaction)

The reversible interaction can take place through:

Hydrophobic adsorption

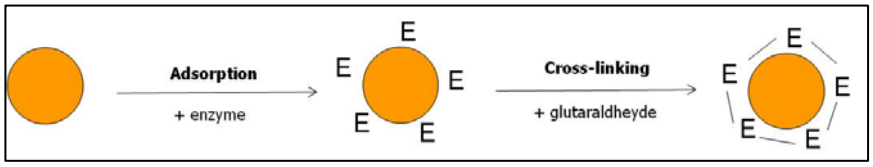
- Hydrophobic adsorbents e.g. ReliZyme™ BU403, OC403 or OD403 and SEPABEADS® EC-BU, SEPABEADS® EC-OC or SEPABEADS® EC-OD;

Ionic interaction

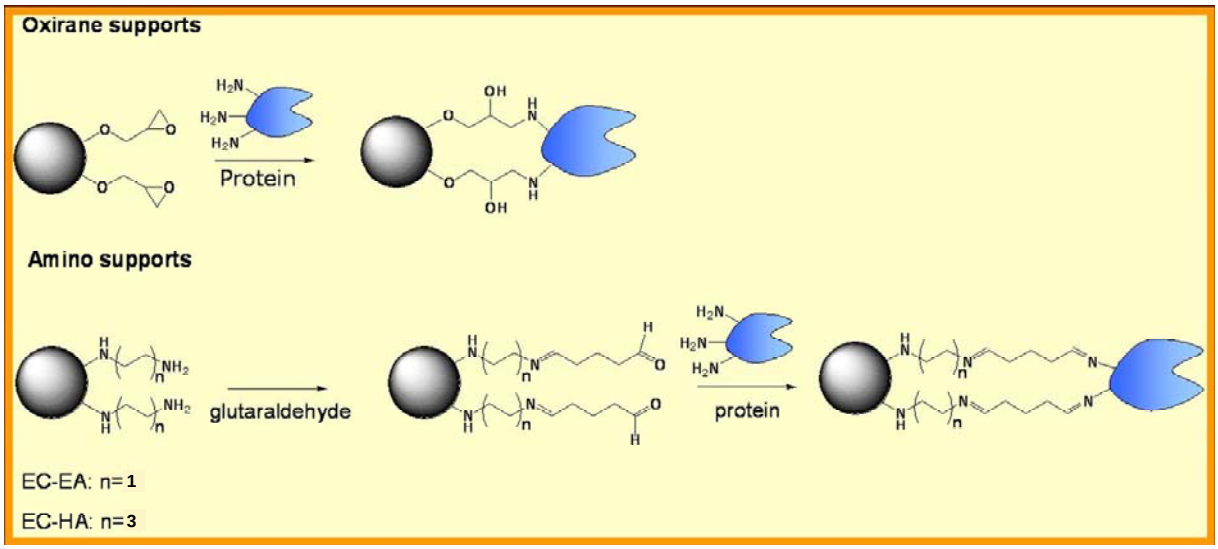
- Amino functionalised carriers e.g. ReliZyme™ EA403 or HA403 SEPABEADS® EC-EA or SEPABEADS® EC-HA;

b. Chemical binding

The reversible immobilisation can become irreversible by means of a cross-linking step: the enzyme is adsorbed onto the carrier and then crosslinked by using, for example, glutaraldehyde. The crosslinked enzyme molecules cover the carrier like a net:



The elective method to obtain an irreversible immobilization is the covalent binding between the enzyme and the functional groups of the carrier. This immobilization can be performed using carriers with oxyrane groups (e.g. ReliZyme™ EP403 or HFA403 and SEPABEADS® EC-EP or SEPABEADS® EC-HFA) or with an amino functionalization (e.g. ReliZyme™ EA403 or HA403 and SEPABEADS® EC-EA or SEPABEADS® EC-HA). In case of amino groups is necessary a pre-activation step with a bifunctional coupling agent, such as glutaraldehyde. Another method is the activation of the hydroxyl functional groups of ReliZyme™ HG403 and SEPABEADS® EC-HG.



Several factors related to the **micro-environment** surrounding the immobilized enzyme have effects on the efficiency of the immobilized biocatalyst, as schematically resumed in **Table 1**.

Matrix characteristics	Effect	Effect on catalytic efficiency
Type of functional group and surface polarity	Enzyme orientation	Active sites availability
Porosity	Mass transfer	Turn over rate
Type of functional group type and surface polarity	Reagent or product accumulation	Inhibition phenomena
Spacer arm length	Mass transfer; system flexibility	Stability and active sites accessibility

Table 1

Purchase Information: Relizyme™

Product name	Code	Pack size (kg wet)	Product name	Code	Pack size (kg wet)
EP403/S	10154Z	0.1	EP403/M	10124Z	0.1
	10154Y	0.25		10124Y	0.25
	101544	0.5		101244	0.5
	101545	1.0		101245	1.0
	101546	5.0		101246	5.0
	101547	10.0		101247	10.0
	101548	≥ 20.0		101248	≥ 20.0
BU403/S	13254Z	0.1	BU403/M	13224Z	0.1
	13254Y	0.25		13224Y	0.25
	132544	0.5		132244	0.5
	132545	1.0		132245	1.0
	132546	5.0		132246	5.0
	132547	10.0		132247	10.0
	132548	≥ 20.0		132248	≥ 20.0
OC403/S	13554Z	0.1	OC403/M	13524Z	0.1
	13554Y	0.25		13524Y	0.25
	135544	0.5		135244	0.5
	135545	1.0		135245	1.0
	135546	5.0		135246	5.0
	135547	10.0		135247	10.0
	135548	≥ 20.0		135248	≥ 20.0
OD403/S	13354Z	0.1	OD403/M	13324Z	0.1
	13354Y	0.25		13324Y	0.25
	133544	0.5		133244	0.5
	133545	1.0		133245	1.0
	133546	5.0		133246	5.0
	133547	10.0		133247	10.0
	133548	≥ 20.0		133248	≥ 20.0
HA403/S	12254Z	0.1	HA403/M	12224Z	0.1
	12254Y	0.25		12224Y	0.25
	122544	0.5		122244	0.5
	122545	1.0		122245	1.0
	122546	5.0		122246	5.0
	122547	10.0		122247	10.0
	122548	≥ 20.0		122248	≥ 20.0
EA403/S	12154Z	0.1	EA403/M	12124Z	0.1
	12154Y	0.25		12124Y	0.25
	121544	0.5		121244	0.5
	121545	1.0		121245	1.0
	121546	5.0		121246	5.0
	121547	10.0		121247	10.0
	121548	≥ 20.0		121248	≥ 20.0

HG403/S	13154Z	0.1	HG403/M	13124Z	0.1
	13154Y	0.25		13124Y	0.25
	131544	0.5		131244	0.5
	131545	1.0		131245	1.0
	131546	5.0		131246	5.0
	131547	10.0		131247	10.0
	131548	≥ 20.0		131248	≥ 20.0
HFA403/S	10254Z	0.1	HFA403/M	10224Z	0.1
	10254Y	0.25		10224Y	0.25
	102544	0.5		102244	0.5
	102545	1.0		102245	1.0
	102546	5.0		102246	5.0
	102547	10.0		102247	10.0
	102548	≥ 20.0		102248	≥ 20.0

Purchase Information: SEPABEADS® EC

Product name	Code	Pack size (kg wet)	Product name	Code	Pack size (kg wet)
EC-EP/S	10151Z	0.1	EC-EP/M	10121Z	0.1
	10151Y	0.25		10121Y	0.25
	101514	0.5		101214	0.5
	101515	1.0		101215	1.0
	101516	5.0		101216	5.0
	101517	10.0		101217	10.0
	101518	≥ 20.0		101218	≥ 20.0
EC-BU/S	13251Z	0.1	EC-BU/M	13221Z	0.1
	13251Y	0.25		13221Y	0.25
	132514	0.5		132214	0.5
	132515	1.0		132215	1.0
	132516	5.0		132216	5.0
	132517	10.0		132217	10.0
	132518	≥ 20.0		132218	≥ 20.0
EC-OC/S	13551Z	0.1	EC-OC/M	13521Z	0.1
	13551Y	0.25		13521Y	0.25
	135514	0.5		135214	0.5
	135515	1.0		135215	1.0
	135516	5.0		135216	5.0
	135517	10.0		135217	10.0
	135518	≥ 20.0		135218	≥ 20.0
EC-OD/S	13351Z	0.1	EC-OD/M	13321Z	0.1
	13351Y	0.25		13321Y	0.25
	133514	0.5		133214	0.5
	133515	1.0		133215	1.0
	133516	5.0		133216	5.0
	133517	10.0		133217	10.0
	133518	≥ 20.0		133218	≥ 20.0
EC-HA/S	12251Z	0.1	EC-HA/M	12221Z	0.1
	12251Y	0.25		12221Y	0.25
	122514	0.5		122214	0.5
	122515	1.0		122215	1.0
	122516	5.0		122216	5.0
	122517	10.0		122217	10.0
	122518	≥ 20.0		1222218	≥ 20.0
EC-EA/S	12151Z	0.1	EC-EA/M	12121Z	0.1
	12151Y	0.25		12121Y	0.25
	121514	0.5		121214	0.5
	121515	1.0		121215	1.0
	121516	5.0		121216	5.0
	121517	10.0		121217	10.0
	121518	≥ 20.0		121218	≥ 20.0

EC-HG/S	13151Z	0.1	EC-HG/M	13121Z	0.1
	13151Y	0.25		13121Y	0.25
	131514	0.5		131214	0.5
	131515	1.0		131215	1.0
	131516	5.0		131216	5.0
	131517	10.0		131217	10.0
	131518	≥ 20.0		131218	≥ 20.0
EC-HFA/S	10251Z	0.1	EC-HFA/M	10221Z	0.1
	10251Y	0.25		10221Y	0.25
	102514	0.5		102214	0.5
	102515	1.0		102215	1.0
	102516	5.0		102216	5.0
	102517	10.0		102217	10.0
	102518	≥ 20.0		102218	≥ 20.0

ReliZyme™ and SEPABEADS® EC Material Support File

Resindion S.R.L., an UNI EN ISO 9001:2008 certified Company, offers the following regulatory documents for each product:

- technical data sheet and relevant technical literature
- certificate of analysis
- material safety data sheet


Partial Agreement
in the Social and Public Health Field
Accord Partiel
dans le domaine social et de la santé publique

CONSUMER HEALTH PROTECTION COMMITTEE

COMMITTEE OF EXPERTS ON MATERIALS COMING INTO CONTACT WITH FOOD

POLICY STATEMENT CONCERNING

ION EXCHANGE AND ADSORBANT RESINS IN THE PROCESSING OF FOODSTUFFS

Version 3 – 28.01.2009

All substances used for the manufacture of ReliZyme™ and SEPABEADS® EC are selected among those reported in the European Resolution ResAP (2004) 3 Version 3 – 28.01.2009, which is related to the resins that can be used in the processing of foodstuffs.

Handling and storage

Users are requested to observe the generally accepted precautions for handling of chemicals and to follow the health and safety recommendations set out in each ReliZyme™ and SEPABEADS® EC MSDS. SEPABEADS® EC -EP and SEPABEADS® EC -HFA and ReliZyme™ EP403 and HFA403 have to be stored at 4—6°C and for no longer than six months.

Technical assistance

Resindion S.R.L. qualified technical and marketing team guarantees all the necessary customer assistance about ReliZyme™ and SEPABEADS® EC selection and application. Please consult Resindion at: technicalservice@resindion.com.

Resindion S.R.L.
Via Roma 55
20082 Binasco (MI), Italy
Phone: +39-02-9001301
Fax: +39-02-90090774
E-mail: info@resindion.com
Web site: www.resindion.com

Mitsubishi Chemical Corporation
Palace Building
1-1 Marunouchi 1-chome, Chiyoda-ku
Tokyo 100-8251, Japan
Phone: +81-3-6748-7146
Fax: +81-3-3286-1209
Web site: www.diaion.com