



A new biocatalyst: Penicillin G Acylase immobilized in sol-gel micro-particles with magnetic properties

Susana Maria da Silva Agostinho Bernardino, Pedro Fernandes, Luís Fonseca

► To cite this version:

Susana Maria da Silva Agostinho Bernardino, Pedro Fernandes, Luís Fonseca. A new biocatalyst: Penicillin G Acylase immobilized in sol-gel micro-particles with magnetic properties. *Biotechnology Journal*, 2009, 4 (6), pp.695-n/a. <10.1002/biot.200800287>. <hal-00480828>

HAL Id: hal-00480828

<https://hal.science/hal-00480828v1>

Submitted on 5 May 2010

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



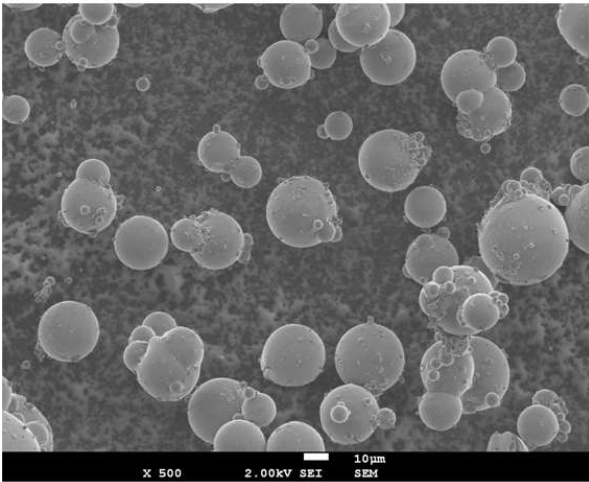
HAL Authorization



A new biocatalyst: Penicillin G Acylase immobilized in sol-gel micro-particles with magnetic properties

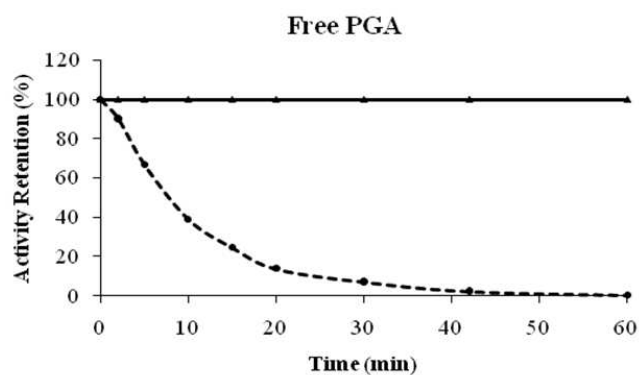
Journal:	<i>Biotechnology Journal</i>
Manuscript ID:	BIOT-2008-0287.R1
Wiley - Manuscript type:	Research Article
Date Submitted by the Author:	23-Feb-2009
Complete List of Authors:	Bernardino, Susana; Escola Superior de Tecnologia do Mar-Instituto Politécnico de Leiria; Instituto Superior Técnico, Engenharia Química e Biológica Fernandes, Pedro; Instituto Superior Técnico, Engenharia Química e Biológica Fonseca, Luís; Instituto Superior Técnico, Engenharia Química e Biológica
Keywords:	cephalexin, immobilization, penicillin G acylase, sol-gel





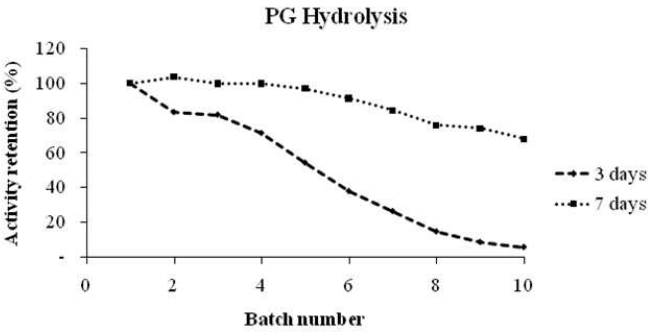
Bernardino et al.
Figure 1

Figure 1 - SEM micrograph of sol-gel micro-particles with encapsulated magnetite and PGA (bar match 10 µm).
254x190mm (96 x 96 DPI)



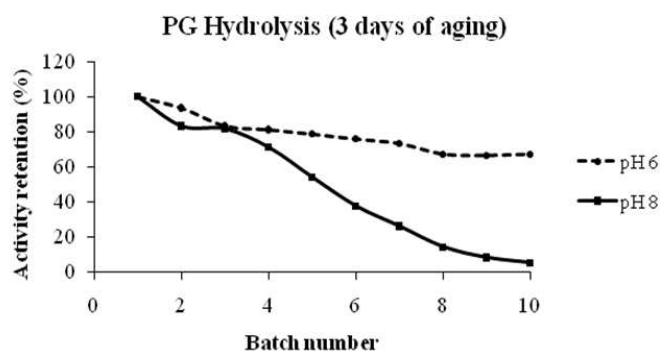
Bernardino et al.
Figure 2

Figure 2 - Thermal stability in phosphate buffer 100 mM pH 7.6 (□) and in the same buffer solution with 35% methanol (v/v) (•) at 37 °C. Enzyme assays were performed by NIPAB method.
254x190mm (96 x 96 DPI)



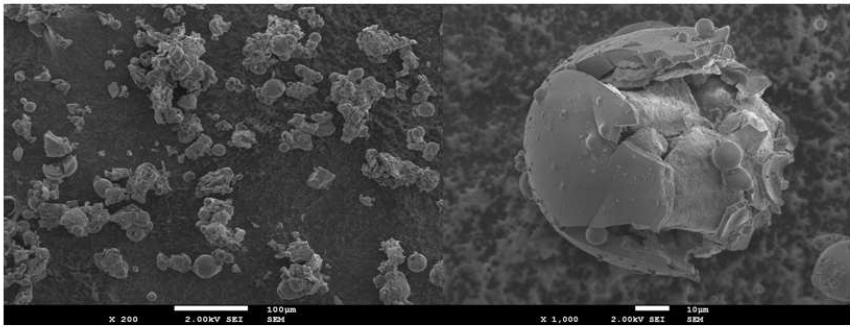
Bernardino et al.
Figure 3

Figure 3 – Activity retention for PG hydrolysis in micro-particles with 3 and 7 days of aging determined according to the PG hydrolysis standard method (pH STAT method). Operational stability runs were performed at pH 6.0 and pH 8.0 in a magnetic stirred reactor.
254x190mm (96 x 96 DPI)



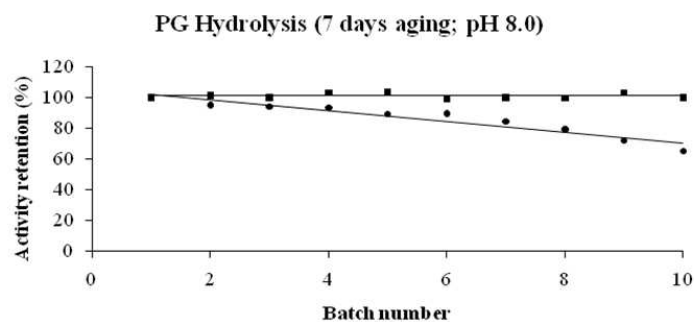
Bernardino et al.
Figure 4

Figure 4 - Activity retention for PG hydrolysis in micro-particles with 3 days of aging determined according to the PG hydrolysis standard method (pH STAT method). Operational runs were performed at pH 6.0 and pH 8.0 in a magnetic stirred reactor.
254x190mm (96 x 96 DPI)



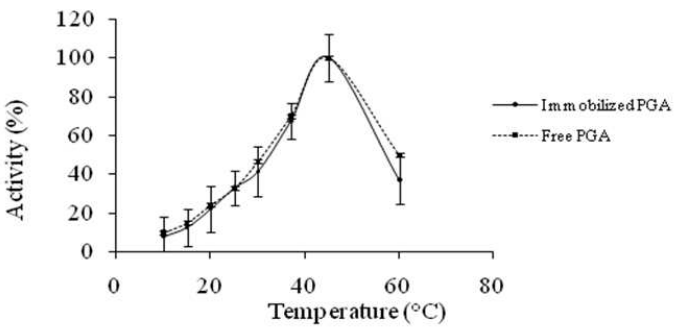
Bernardino et al.
Figure 5

Figure 5 - Example of micro-particles degradation (magnetic stirred reactor) after 10 runs of PG hydrolysis.
254x190mm (96 x 96 DPI)



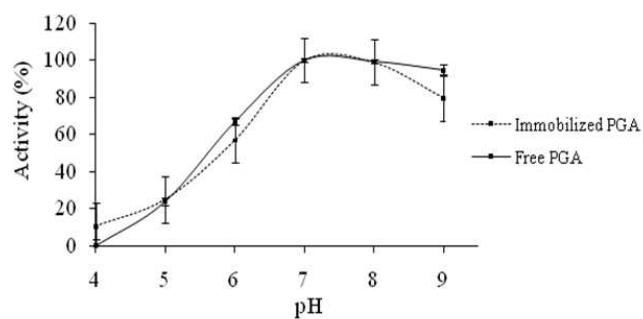
Bernardino et al.
Figure 6

Figure 6 - Activity retention for PG hydrolysis in micro-particles with 7 days of aging determined according to the PG hydrolysis standard method (pH STAT method). Operational stability runs were performed at pH 8.0 in a magnetic stirred reactor (●) and in a differential recycled reactor (■).
254x190mm (96 x 96 DPI)



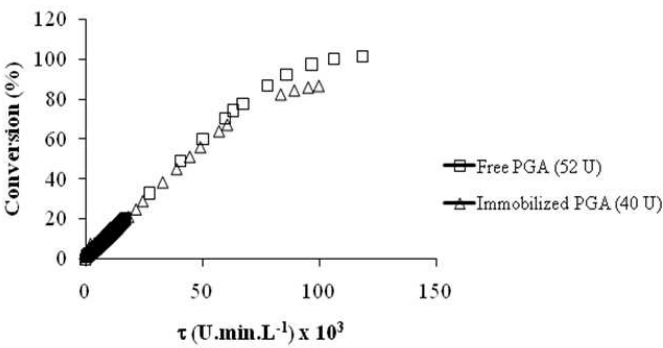
Bernardino et al.
Figure 7

Figure 7 - Relative activity versus temperature at pH 8.0 (pH STAT method) for free and immobilized enzyme.
254x190mm (96 x 96 DPI)



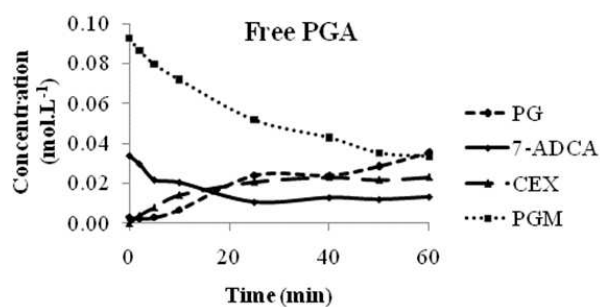
Bernardino et al.
Figure 8

Figure 8 – Relative activity versus pH at 37 °C (pH STAT method) for free and immobilized enzyme.
254x190mm (96 x 96 DPI)



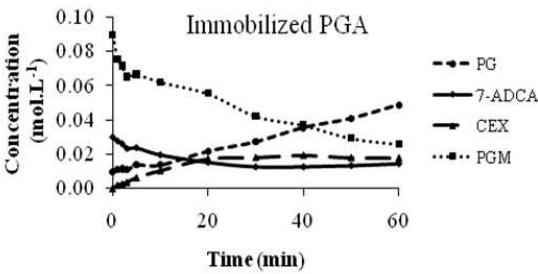
Bernardino et al.
Figure 9

Figure 9 – Penicillin G hydrolysis (pH STAT method) with micro-particles of biocatalyst. Runs were performed at 37°C and pH 8.0, 20 mM phosphate buffer, for an initial PG concentration of 4% (m/v). The variable ζ represents the normalized residence time (U.min.L-1),[18, 21].
254x190mm (96 x 96 DPI)



Bernardino et al.
Figure 10

Figure 10 – Cephalexin synthesis performed by free PGA. Runs were carried out at 14 °C. The pH shifted from 8.0 to 7.5 at the end of the reaction. A conversion yield of 68% was observed, along with a productivity of 23 mM.h⁻¹.
254x190mm (96 x 96 DPI)



Bernardino et al.
Figure 11

Figure 11 – Cephalixin synthesis performed by micro-particles of biocatalyst. Runs were carried out at 14 °C. The pH shifted from 8.0 to 7.65 at the end of the reaction. A conversion yield of 65% was observed, along with a productivity of 19 mM.h⁻¹ and a specific productivity of 95 mM.h⁻¹.g⁻¹.
254x190mm (96 x 96 DPI)