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Bulletin of Chemical Reaction Engineering & Catalysis Open Access
Volume 14, Issue 2, August 2019, Pages 369-379

Immobilization of Candida rugosa lipase on aminated polyvinyl benzyl chloride-grafted nylon-6 microfibers (Article) (Open Access)

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Abstract

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This paper demonstrates a simplified procedure for the preparation of a nylon-6 microfibers based support for the immobilization of Candida rugosa lipase via covalent attachment to enhance the stability and reusability of lipase. The preparation of the support was done by radiation induced graft copolymerization (RIGC) of vinyl benzyl chloride (VBC) onto nylon-6 microfibers followed by amination with ethanolamine to facilitate the immobilization of lipase. Fourier transfer infra red (FTIR) and scanning electron microscope (SEM) were used to study the chemical and physical changes following grafting, amination and immobilization. Response surface methodology (RSM) was applied for the optimization of lipase immobilization on the aminated microfibers. The optimization parameters were incubation time, pH, and lipase concentration. Moreover, this study investigated the effect of temperature, pH, and storage stability and reusability on the lipase in its immobilized and free forms. The developed model from RSM showed an R2 value of 0.9823 and P-value < 0.001 indicating that the model is significant. The optimum temperatures for both immobilized and free lipases were 45 °C, whereas the best pH values for lipase activity were at pH 8 and pH 7, respectively. This study also identifies values for KM and Vmax for both immobilized and free lipase accordingly. Based on the results, immobilized lipase had significantly improved the stability and reusability of lipase compared to that in free forms.

Author keywords

Amination | Enzyme activity | Lipase immobilization | Optimization | PVBC-grafted nylon-6 microfiber | Response surface methodology

Indexed keywords

Engineering controlled terms: Amination | Amines | Candida | Chlorine compounds | Enzyme activity | Grafting (chemical) | Microfibers | Optimization | Polyamides | Polyvinyl chlorides | Rayon | Reusability | Scanning electron microscopy | Surface properties | Yeast

Engineering uncontrolled terms: Candida rugosa lipase | Effect of temperature | Lipase immobilization | Micro-fiber | Optimization parameter | Radiation-induced graft copolymerizations | Response surface methodology | Vinyl-benzyl chlorides

Engineering main heading: Enzyme immobilization

Funding details

Funding sponsor	Funding number	Acronym
Ministry of Higher Education, Malaysia		

Funding text
The authors acknowledge the financial support from a research grant (FRGS 14-162-0403) obtained under the Fundamental Research Grants Scheme, Ministry of Higher Education (MOHE), Malaysia. Special thanks to Dr. Teo Ming Ting from Malaysia Nuclear his assistance in grafting process.

ISSN: 19782993
DOI: 10.9767/bcrec.14.2.2894.369-379
Source Type: Journal
Document Type: Article
Original language: English
Publisher: Diponegoro University

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