以可逆溶解型擔體固定澱粉糖化酵素之研究

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摘 要

本研究將澱粉糖化酵素（GLUCOAMYLASE），藉由幾種化學活性劑與腸胃藥用包覆劑（ENTERIC COATING POLYMER）形成可逆溶解型固定化澱粉糖化酵素。此固定化酵素會隨之於可溶狀態下進行反應，而於反應後藉著改變溶液之PH值，使酵素隨沉澱的擔體與溶液分離，而達到重複使用的目的。本研究主要分為兩部分。第一部份係利用一些具代表性之PH值型可逆溶解型高分子AS-L、HP-50及CAP三種，並且藉由幾種化學活性劑如戊二醛（GLUTARALDEHYDE）、碳化二亞胺（N-ETHYL-N-（-3-DIMETHYLAMINOPROPYL）CARBODIIMIDE HYDROCHLORIDE, EDC）及三聚氯化氰（CYANURIC CHLORIDE）對澱粉糖化酵素作固定化，而形成可逆溶解型固定化酵素，並根據研究分析所得固定化酵素之活性及固定量，來篩選適合的固定化擔體。第二部分則以最適當的擔體及最適化的操作條件來探討固定化酵素與游離酵素之基本性質、操作穩定性、熱穩定性及動力學性質的差異。 就本研究結果發現，以使用CAP擔體之固定化酵素之酵素活性與蛋白質固定量效果最好；其中當CAP濃度在32 MG/ML時不論使用何種活化劑，所能固定之最大酵素量約為5 MG/ML，並且酵素活性約為173 U/ML。 在基本性質方面，此游離與固定化酵素之最適作用溫度分別是50 ℃和55 ℃。而最適作用PH值分別介於6.0~7.0與7.0~8.0之間。在熱穩定性方面，固定化酵素相較於游離酵素有較好之穩定度。 在動力學性質方面，根據固定化酵素與游離酵素之KM與VMAX變化結果，顯示酵素固定於可逆溶解不溶解型擔體上無明顯的質傳阻力影響，而擔體在固定化酵素之反應中存在非競爭性（NONCOMPETITIVE）之作用。本研究最後發現游離與固定化酵素之間反應活化能相類似，在不同澱粉濃度下反應也是如此。表示固定化酵素之反應不受擴散因素的影響，而為單純反應速率所控制。

關鍵詞 : 澱粉糖化酵素、可逆溶解性、固定化酵素

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