利用固定化菌株顆粒以提升酒精產量之研究

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摘 要

在過去十年之間，生物工藝主要致力以木質纖維素做為生產酒精燃料之運用，除具有經濟效益也能和能源危機問題競爭發展。由於酵素水解和酒精醱酵的環境相似，所以可選擇將兩個步驟同時在單一容器裡一起反應，因此，這種應用糖化和醱酵（Simultaneous sccharification and fermentation，SSF）或者利用分開水解與醱酵 (Separate Hydrolysis and Fermentation，SHF)來將木質纖維素轉化為酒精的共醱酵程序，更具節省成本效益。本研究中，從麝香貓(果子狸)的糞便中，篩選出一株具有高酒精生產能力的酵母菌，根據16S rDNA的基因序鑑定後，命名為 Saccharomyces cerevisiae Wu-Y2。為了能提昇酒精的生產能力，實驗中將利用包埋法把Wu-Y2菌株固定化於PVA膠體顆粒。此外，在利用固定化細胞來進行反應器之擴大酒精生產時，我們設計了不同的醱酵參數來作為因子探討，包括顆粒填充比、水力滯留時間(HRT)及入流的glucose濃度。由實驗結果得知，當使用反應器在3.34%的顆粒填充比，以HRT為8 hr做為系統的生產條件時，可達有的最大酒精生產量則為19.8 g/L (47%)。除此之外，實驗中也研究利用細菌纖維膜 (BCM)來當作一種新型固定化技術的載體材料，由研究成果得知，利用BCM來固定化酵母菌細胞，相較於懸浮的醱酵系統，則是有較佳的生產操控性和酒精產力表現(9.2 g/L)。另一方面，本研究也特別設計了一組屬於懸吊式類型的固定化反應器，透過這反應器的運用而可順利將羧甲基纖維素（Carboxymethyl cellulose，CMC）轉化成能被醱酵利用的glucose。實驗中所使用的PVA固定化顆粒，其顆粒結構的顯微觀察和機械強度表現，分別利用電子顯微鏡(Scanning Electron Microscopy，SEM) 和強度測定儀(Rheometer)來完成檢測。

關鍵詞 : 酸水解、纖維素、還原糖、固定化、填充床、酒精生產

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