結合纖維素分解菌與固定化產醇菌之共培養系統以提升乙醇產量之研究

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摘 要

目前纖維素(cellulose)轉化成生質乙醇(bio-ethanol)之過程中，所需之纖維素分解酵素(cellulase)純化成本過高。為了降低成本，本研究提出一種微生物共培養系統(co-culturing systems)，係以纖維素分解菌株與乙醇生產菌株培養於同一系統，並運用細胞固定化技術(cell-immobilized technology)，建立懸浮纖維素分解菌與固定化乙醇生產菌之共培養產醇系統，即於同一系統下進行酵素生產、酵素水解及乙醇生產。本研究主要利用批次試驗進行兩方面之探討，第一部分為探討不同環境因子對乙醇生產菌株Zymomonas mobilis生產乙醇之影響，同時比較懸浮菌體與固定化菌體顆粒生產乙醇之情形；第二部分則為探討共培養產醇系統之可行性。 研究結果顯示：(1) Z. mobilis之固定化菌體顆粒，可生產乙醇之培養溫度範圍為30 – 37 °C、初始pH值範圍為3 – 11及較佳預培養時間範圍為9 – 27小時；(2)不同初始pH值對固定化Z. mobilis生產乙醇之試程，各組之乙醇產量皆有逐時穩定上升之趨勢，表示固定化顆粒具有保護菌體之功能；(3)纖維分解菌Bacillus thermoamylovorans K2與乙醇生產菌Klebsiella pneumoniae THLB0109之菌株組合時，在所研究之三種共培養產醇系統與常溫(30 °C)環境下皆可獲得最佳產醇量；(4)懸浮纖維分解菌Bacillus thermoamylovorans K2，結合固定化乙醇生產菌Klebsiella pneumoniae THLB0109之共培養產醇系統，並於中溫(37 °C)與三種碳源之條件下進行培養，乙醇產量高低依所需之碳源依序為Napiergrass (天然碳源)＞Avicel＞carboxymethyl cellulose (CMC)；(5)於共培養產醇系統，培養溫度影響乙醇產量。

關鍵詞 : 共培養系統、細胞固定化技術、生質乙醇、纖維素

目錄

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