褐藻酸鹽形成的微珠對其膠囊化特性的影響

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摘要

利用包埋技術將酵素及活性化合物固定在褐藻酸鈣微珠中，並使用擠壓法來產生外部凝膠(external gelation，EG)或內部凝膠(internal gelation，IG)。IG 微珠尺寸(4.17~4.42mm)均大於 EG 微珠(3.46~4.03mm)。而微珠的大小主要取決於凝膠的類型，其次為鈣濃度。較高的鈣濃度使得微珠的硬度增加和直徑減少。活性化合物和聚合物之間的相互作用可藉由掃描式電子顯微鏡（Scanning Electron Microscopy，SEM）、熱分析(Thermo Gravimetric Assays，TGA 和 Differential Scanning Calorimetry，DSC)和傅立葉轉換紅外線光譜法(Fourier Transform Infrared Spectrometry，FTIR)進行測試。結果顯示褐藻酸鈉鈣基質和幾丁聚醣外層在 1560 cm^{-1} 觀察到這兩者之間的相互作用。含有天然萃取物膠囊之 DSC 溫度 132˚C 以及 FTIR 光譜 1540 和 1570 cm^{-1} 之間所觀察到的肩峰，表示聚合物和多酚之間的相互作用。利用褐藻酸鈉固定酵素方法可增加麥芽糖酶的熱穩定性，當游離麥芽糖酶在 55 ˚C，90 分鐘後完全失去活性。然而，固定麥芽糖酶在相同條件下，即使經過 180 分鐘仍保有其活性。另外，所有膠囊之玻璃轉化溫度(glass transition temperature，Tg)皆高於室溫，這表示有較佳的產品儲存穩定性。使用幾丁聚醣所包覆之膠囊可保護多酚物質，減少在胃液中被破壞，使他們有較高的量在模擬腸液中可釋放，這是因為有這兩種保護：幾丁聚醣屏障和瑪黛茶萃取物-幾丁聚醣之間強力相互作用。綜合以上結論，我們可使用內凝膠方式製備微珠，作為機能性食品時可增加產品穩定性及延長保存期限，於商業酵素應用上則可增加回收率。另外，在塗覆一層幾丁聚醣的膠囊其多酚物質在腸液中釋放的量較高，可做為具有特定目的輸送系統。

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