以近紅外線光譜儀偵測HI-PS塑膠容器在不同浸出溶液中釋出物之含量

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摘 要

各種塑膠材質在加工成型過程中，所殘留的單體、溶劑和寡聚合體等成分，在進行食品包裝貯存期間以及包裝容器盛裝熱食時會遷移至食品中，而造成嚴重的安全問題。本研究乃探討以近紅外線光譜儀(NEAR INFRARED SPECTROSCOPY, NIRS)檢測耐衝擊性聚苯乙烯 (HIGH IMPACT POLYSTYRENE, HIPS) 盛裝浸出溶液於加熱與貯存過程成分溶出量之可行性。利用四種不同浸出溶液系統(水、15%酒精、3%醋酸與玉米油)，以不同加熱溫度50℃、70℃及90℃分別加熱5、10、20及30分鐘與未加熱之控制組，儲存1至6個月後定期取出，經上部空隙自動取樣及氣相層析儀(HS-GC) 進行成分分析及NIRS掃瞄分析，並建立塑膠容器盛裝浸出溶液所釋出之成分定量用之檢量線與其預測能力之評估。結果顯示，聚苯乙烯盛裝水時，以波長6 NM為間距運算、二次微分處理及STEPWISE的迴歸方法所得檢量線的標準偏差（STANDARD ERROR OF CALIBRATION, SEC）最小，其值為0.1221及相關性R2最高，其值為0.9174，而檢量線的預測能力，即相關係數（CORRELATION COEFFICIENT, R）可達0.961； RPD（THE RATIO OF THE S.D OF THE ORIGINAL DATA TO THE SEP）為4.38，達到"GOOD"的程度。在聚苯乙烯盛裝15％酒精時，以波長8 NM為間距運算、二次微分處理及STEPWISE的迴歸方法所得檢量線的SEC最小為0.6439及R2最高為0.9096，而檢量線的預測能力R值達0.983。在浸出溶液3％醋酸時，以波長8 NM為間距運算、二次微分處理及STEPWISE的迴歸方法所得檢量線的SEC最小為0.1121及R2最高為0.9453，而檢量線的預測能力R值達0.928。而聚苯乙烯盛裝玉米油時，以波長6 NM為間距運算、二次微分處理及STEPWISE的迴歸方法所得檢量線的SEC最小為0.7840及R2最高為0.8718，而檢量線的預測能力R值達0.906。故應可利用此法來偵測聚苯乙烯在盛裝浸出溶液中釋出之成分快速檢測之應用，以提供國內聚苯乙烯製造業及食品包裝技術之參考。

關鍵詞 : 耐衝擊性聚苯乙烯、浸出溶液、近紅外線光譜儀

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