

METHOD DEVELOPMENT IN SEMI AUTOMATED N-HEXANE SOLVENT EXTRACTABLES OF LINEAR LOW AND LOW DENSITY POLYETHYLENE USING FIPA

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ABSTRACT

Hexane extractables in polyethylene are used to determine, amongst others, polymerisation efficiency. In food packaging high levels of hexane extractables could migrate into food and hence they are regulated by FDA¹. The current method (ASTM gravimetric) for the determination of hexane extractables is slow and labour intensive. In addition the results obtained are also known to be operator-dependant. Using a new technology instrument, a method was investigated and developed to increase the sample turnaround times as well as improve on the ASTM gravimetric method reproducibility and operator dependency. This new hexane extractable method was investigated on a GPC hybrid instrument (Viscotek) that utilizes “Flow injection polymer analysis” (FIPA) ². FIPA enables the analyses the injected polymer solution via a GPC column and an RI (refractive index) detector. A polystyrene standard is used to calibrate the instrument with every run. The instrument is also capable of analysing a large number of samples via an auto-sampler unit as the heater unit can accommodate 13 samples over a three hour period. The first trials were successful and the method was subsequently introduced to match the ASTM standard extraction conditions and comparisons were made. Values were found to be in the same range as those obtained with the ASTM standard gravimetric method. Three sample morphologies were investigated (pellets, powder and film) and it was found that powder (ground pellets) and film could successfully be compared to ASTM film extractions. Furthermore, additional polymer characterisation of the original sample, as well as the extracted and the extractable polymer were performed using GPC, Crystaf and DSC. The results from these analyses are in agreement with theoretical expected trends.

References:

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- (2) Nielson, R.; Bernett, J.; Ssfir, S.; Petro, M.; Flow-injection analysis and variable flow light scattering methods and apparatus for characterising polymers, *US Patent, US 6,175,409 B1* **2006**.

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