

Polycaprolactam Analysis on Agilent PLgel MIXED-C by Gel Permeation Chromatography

Application Note

BioPharma

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Introduction

Traditional drug delivery systems such as the oral contraceptive pill have a major disadvantage. The release of the active species is very non-linear, with typically a high dosage at the time of introduction followed by a steady decline as the drug is metabolized. A release profile of this kind is inefficient and potentially ineffective. Ideally, the dosage of the active compound into the body should remain at a constant level during treatment. The controlled delivery of drugs in vitro to produce linear dosing regimes is a major goal of therapeutic research. Polycaprolactam is a well-known polymer that biodegrades by enzymatic cleavage of ester bonds under conditions found within the human body. Introducing an active drug contained in a matrix of polycaprolactam into the body leads to the steady release of drug as the polymer matrix degrades. Appropriate inclusion of the drug into the excipient matrix controls the rate of release.

A critical parameter controlling the rate of degradation of biodegradable polymers is the molecular weight of the starting material; the higher the average molecular weight, the slower the rate of biological degradation. Measuring the molecular weight distributions of biodegradable polymers by gel permeation chromatography (GPC) is a critical part of research into controlled drug release with polymers.





Polycaprolactam Analysis

The chromatogram in Figure 1 shows polycaprolactam obtained in THF using two Agilent PLgel 5 μ m MIXED-C columns. The polymer eluted as a broad peak with an average molecular weight of 80,000 g/mol and a polydispersity of 2.5.

Conditions

Columns $2 \times Agilent PLgel 5 \mu m MIXED-C, 7.5 \times 300 mm$

(p/n PL1110-6500)

Eluent THF (stabilized)

Flow rate 1.0 mL/min

Inj vol 200 μL

Detector RI

System Agilent PL-GPC 50

Conclusion

Gel permeation chromatography can be used as a tool to assess the performance characteristics of biodegradable polymers such as polycaprolactam using Agilent PLgel columns.

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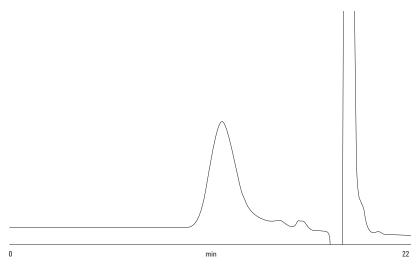


Figure 1. The broad molecular weight distribution of a polycaprolactam revealed by gel permeation chromatography with Agilent PLgel MIXED-C columns.

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