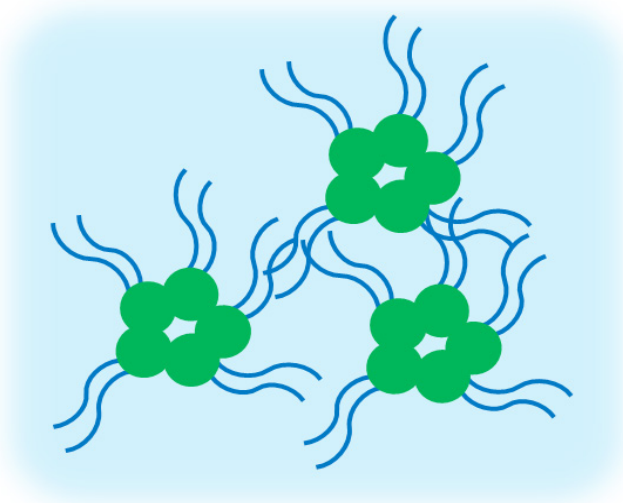


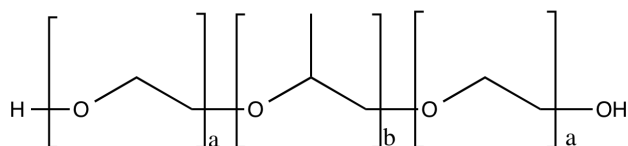
## Determining weight percent oxyethylene in Pluronic F127

### Introduction

A poloxamer is a synthetic block copolymer made up of ethylene oxide and propylene oxide. Pluronic F127 is an example of a poloxamer commonly used as a non-ionic surfactant. The weight percentage oxyethylene is designated in the final number of the three digit name. In Pluronic F127 the "7" means there is 70 weight percent oxyethylene. Here we demonstrate the NMR method published by the United States Pharmacopeia for determining weight percent oxyethylene of poloxamers using Pluronic F127.



### USP Method



The poloxamer is made up of three domains, one hydrophobic polypropylene oxide block in the center straddled by hydrophilic polyethylene oxide blocks at both ends. The size and ratio of these blocks will change the chemical and physical properties of the polymer as a whole. The spectrum of Pluronic F127 is shown below. The doublet at about 1 ppm is the propylene  $\text{-CH}_3$  peak, while the peak at about 3.6 ppm is the  $\text{CH}_2\text{O}$  resonance of both the oxyethylene and oxypropylene backbones and also the  $\text{CHO}$  peak from oxypropylene.

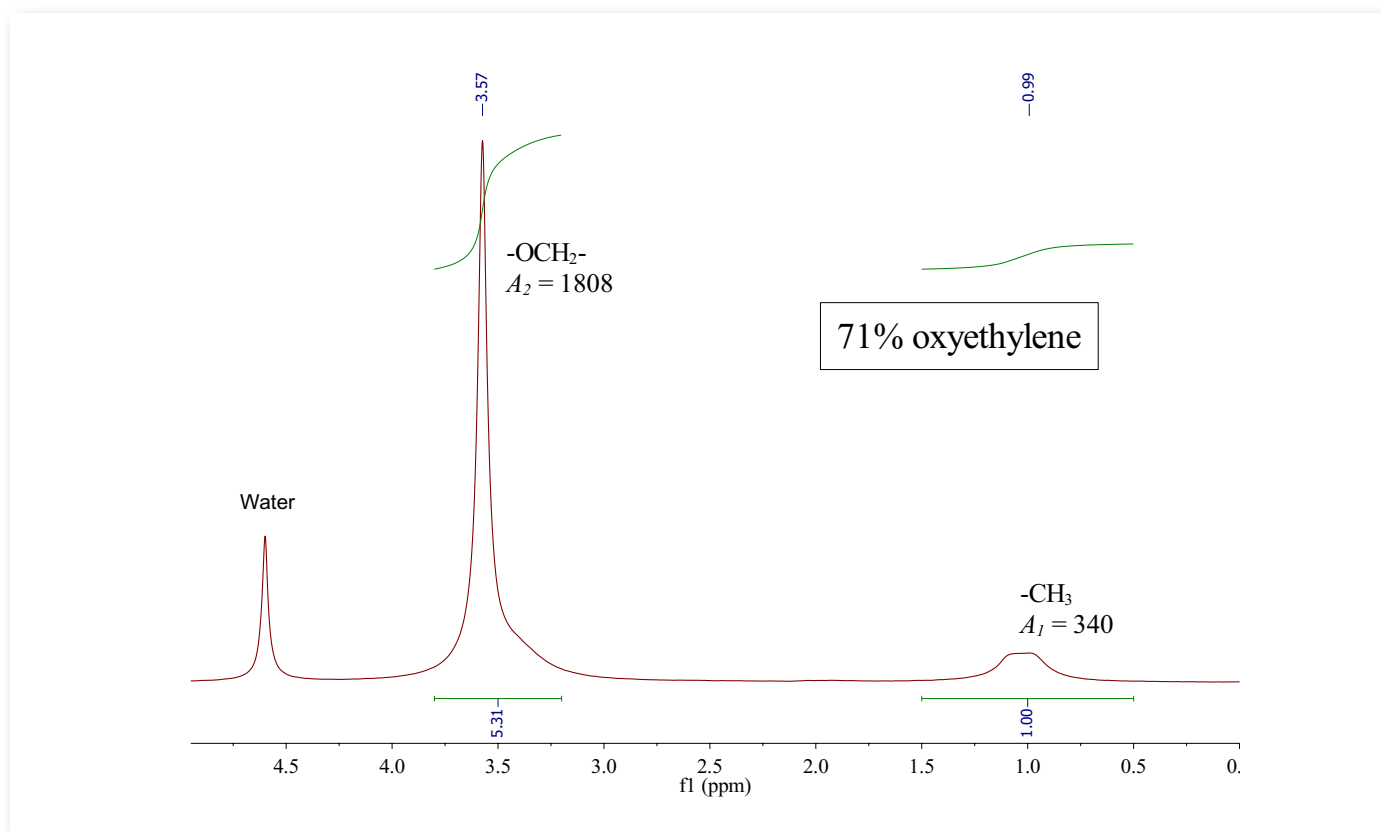
The integrals of these peaks are used to calculate the weight percentage oxyethylene from the equation:

$$\% \text{ oxyethylene} = 3300 \times \frac{\alpha}{33 \times \alpha + 58}$$

where  $\alpha = \frac{A_1}{A_2} - 1$

and  $A_1$  is the integral of the doublet at 1.08 ppm and  $A_2$  is the integral of the composite peak from 3.2 to 3.8 ppm.

The Pluronic F127 was dissolved in deuterated water at a concentration of about 5% by weight and measured on a Spinsolve Proton benchtop NMR spectrometer. The measured weight percent oxyethylene was 71%.



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