



Challenges in developing polymer flocculants to improve bitumen quality in non-aqueous extraction processes: an experimental study

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Abstract

The objective of this study was to evaluate the effect of different polymer flocculants on the quality of bitumen extracted from heavy oil using a non-aqueous extraction process. The study was conducted using a 2³ factorial design, with the factors being the type of polymer flocculant (polyacrylamide, polyvinyl alcohol, and polyethylene glycol), the concentration of the polymer flocculant (0.1, 0.2, and 0.5%), and the extraction temperature (20, 40, and 60 °C). The results showed that the use of polymer flocculants significantly improved the quality of the extracted bitumen, with polyacrylamide showing the most significant improvement. The concentration of the polymer flocculant also had a significant effect on the quality of the bitumen, with higher concentrations generally resulting in higher quality bitumen. The extraction temperature also had a significant effect on the quality of the bitumen, with higher temperatures generally resulting in higher quality bitumen. The study concluded that the use of polymer flocculants is a promising method for improving the quality of bitumen extracted from heavy oil using a non-aqueous extraction process.

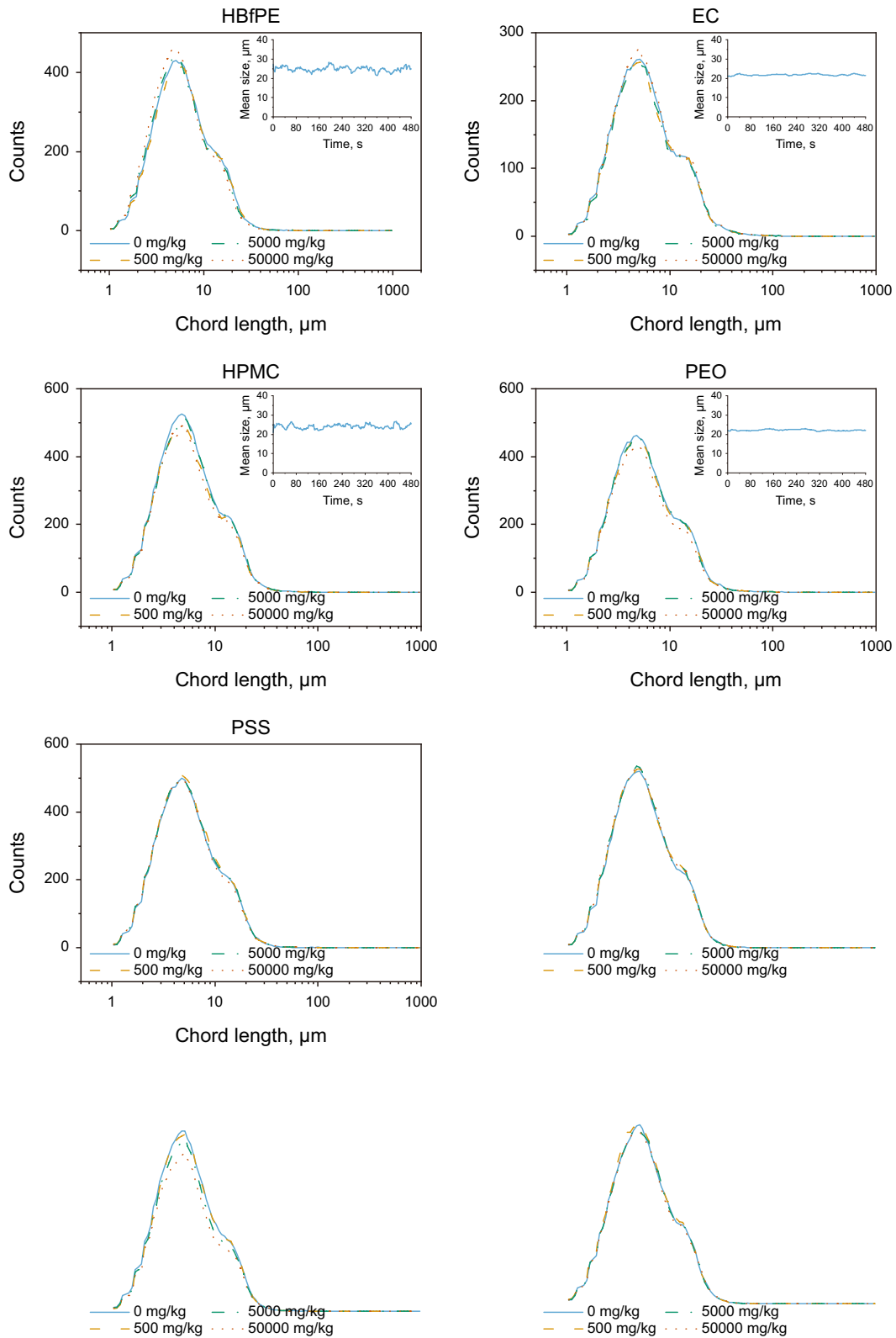
Keywords Bitumen · Polymer flocculants · Non-aqueous extraction · Quality · Heavy oil

1 Introduction

Bitumen is a complex mixture of high molecular weight hydrocarbons, which is a by-product of the petroleum refining process. It is a viscous, black, and solid material that is used in a wide range of applications, including road construction, roofing, and waterproofing. The quality of bitumen is a critical factor in determining its performance in these applications. However, the quality of bitumen extracted from heavy oil using a non-aqueous extraction process is often poor, due to the presence of impurities and the low yield of the process. This has led to the development of various methods for improving the quality of bitumen extracted from heavy oil, including the use of polymer flocculants. Polymer flocculants are high molecular weight polymers that are used to aggregate small particles into larger flocs, which can then be easily separated from the liquid phase. This process is known as flocculation, and it is a common method for improving the quality of various types of suspensions and emulsions. In the case of bitumen extraction, polymer flocculants are used to aggregate the bitumen particles, which are then separated from the heavy oil phase. This process has been shown to significantly improve the quality of the extracted bitumen, with higher yields and higher quality bitumen. However, the use of polymer flocculants is not without challenges. One of the main challenges is the selection of the appropriate polymer flocculant and concentration. Different polymer flocculants have different properties, and their effectiveness in improving bitumen quality can vary significantly. Additionally, the concentration of the polymer flocculant can also have a significant effect on the quality of the bitumen. Therefore, it is essential to conduct a thorough experimental study to evaluate the effect of different polymer flocculants and concentrations on the quality of bitumen extracted from heavy oil using a non-aqueous extraction process. This study aims to address this need by evaluating the effect of different polymer flocculants (polyacrylamide, polyvinyl alcohol, and polyethylene glycol), concentrations (0.1, 0.2, and 0.5%), and extraction temperatures (20, 40, and 60 °C) on the quality of bitumen extracted from heavy oil using a non-aqueous extraction process. The results of this study will provide valuable information for the development of more effective methods for improving the quality of bitumen extracted from heavy oil using a non-aqueous extraction process.

Electronic supplementary material
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