Thermogravimetric Analysis of Polyethylene Oxide Nanofibers

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INTRODUCTION

The chemical and physical properties of polymers and polymer-based nanofibers are influenced by their thermal stability. Polyetheylene oxide (PEO) is an important polymer in the pharmaceutical industry and other applications. Thermogravimetric (TGA) measurements were performed on both the polymer and the polymer-based nanofibers by using a Netzsche TG 209F3 instrument operating under nitrogen atmosphere, in the temperature range 50 to 1000 $^{\circ}$C with different heating rates ranging from 1 $^{\circ}$C/min up to 50 $^{\circ}$C/min

OBJECTIVE:

To understand how different heating rates affect the degradation temperature of PEO and PEO-based nanofibers

RESULTS

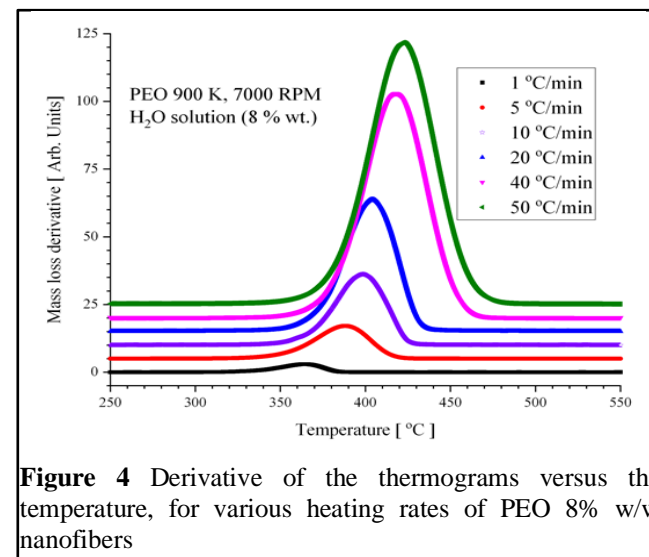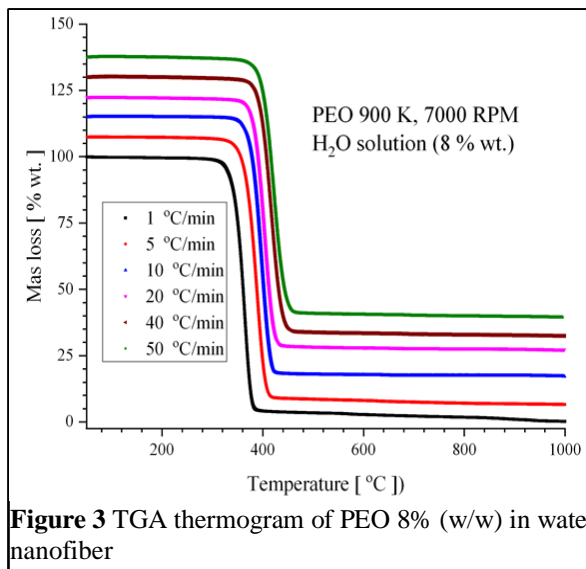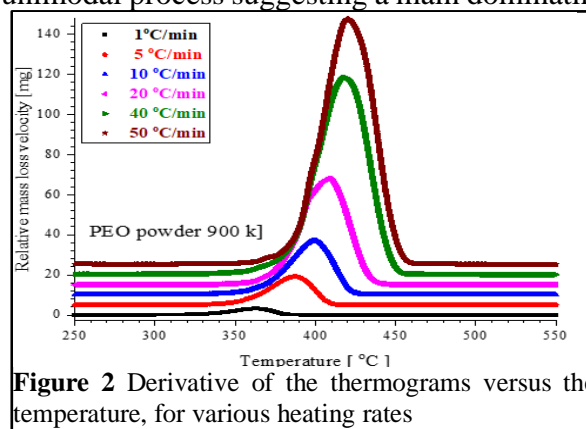TGA data on PEO powder, with a molecular

Figure 1. TGA data on PEO powder, with a molecular mass of 900 000 gmol^{-1}, recorded at various heating rates
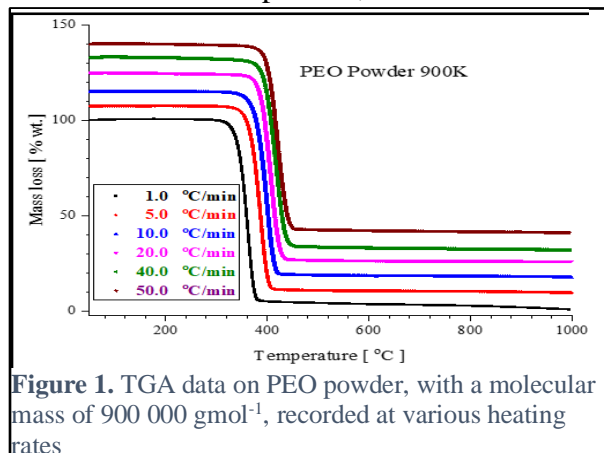
mass of 900 000 gmol^{-1}, have been recorded at various heating rates; some examples are shown in Figures 1 and 3. The derivatives of the mass

DISCUSSION

The degradation of PEO nanofibers is an unimodal process suggesting a main dominating

Figure 2 Derivative of the thermograms versus the temperature, for various heating rates

Figure 3 TGA thermogram of PEO 8% (w/w) in water nanofiber

Figure 4 Derivative of the thermograms versus the temperature, for various heating rates of PEO 8% w/w nanofibers

contribution. The derivative of the as recorded thermograms with respect to the temperature exhibits a maximum representing the highest mass loss rate. This maximum shifts to higher temperature as the heating rate increases. Additionally, it is reported for the first time that the width of the TGA derivative versus temperature is decreasing as the temperature rate is increased. The degradation of PEO nanofibers exhibits a weak dependence on the nature of solvent. The residual mass at 1000^{0}C is independent on the heating rates.

CONCLUSION

It is concluded that the temperature at which the mass loss is maximum shifted towards higher values as the heating rate is increased.