Raman Investigation of Some Polymeric Gels of Pharmaceutical Interest

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Introduction

The use of the polymeric matrix as vehicle for the active substance is a new trend in the design of a new pharmaceutical systems used in the treatment of many diseases.

The polymeric bioadhesive pharmaceutical systems ensure a selective release of the drug at the site of application as well as a prolonged release which can contribute to the achievement of an increased bioavailability[1,2].

These systems are submitted to the aggressive action of some physical and chemical factors like the temperature, the mechanical action, the chemical environment, that can modify the structure and the properties of the polymeric matrix and of the drug substance[3].

Objective

The study of the behavior of the local structure of some polymeric matrix under the repeated action of the water, by Raman spectroscopy.

Experimental

Materials

The polymers: polyethylene oxides (PEO) Sentry Polyox WSRN 750 NF (PEO 750), Sentry Polyox WSR-1105 NF (PEO 1105) – Union Carbide Europe S.A., Switzerland, polyacrylic acid (Carbopol 940 and 980) - B.F. Goodrich, Germany.

The polymeric gels preparation were made by mixing slowly the polymer powder with distilled water.

The studied samples contained 5%, 6%, 10% polymer (PEO or Carbopol).

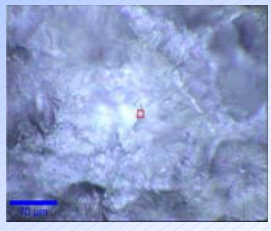
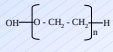


Fig. 1 The aspect of the polymeric matrix



The repeated unit of poly(ethylene oxide) PEO;

The repeated unit of the acrylic acid

Methods:

Raman spectroscopy : 20-2000 cm^{-1}, co focal Raman microscope (Witec CRM 200) 25±0.5°C, 100mW, 633 nm.

The effect of repeated action of water.

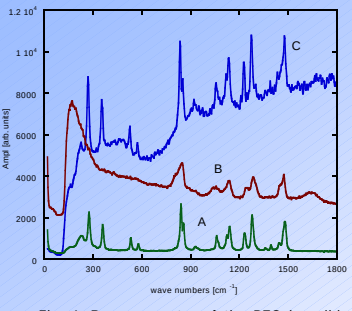


Fig. 4. Raman spectra of the PEO in solid state (curve A); in the aqueous state (hydogel), (curve B); and in dried gel, (curve C).

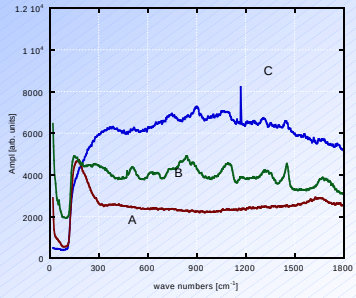


Fig. 5. The spectra of the polyacrylic acid gel in different states. Curve A, the polyacrylic acid in aqueous gel state; Curve B, the polyacrylic acid in powder state; Curve C, the polyacrylic acid gel after the evaporation of the water

Results

The influence of the molecular mass

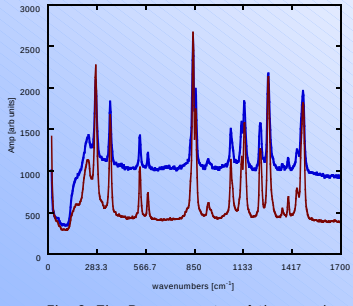


Fig. 2. The Raman spectra of the samples PEO 750 (the red line) and PEO 1105 (the blue line), in solid state.

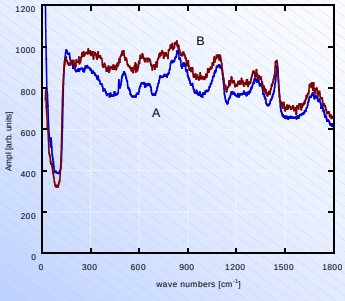


Fig. 3. The spectra of the polyacrylic acid (Carbopol) with different molecular mass: Carbopol 940 (curve A) and Carbopol 980 (curve B) in powder state.

The influence of the polymeric concentration

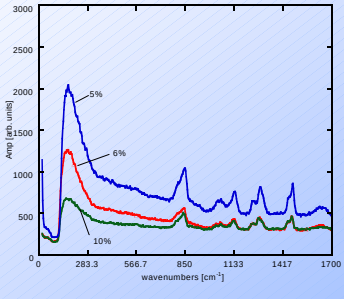


Fig. 6. The Raman spectra of PEO 750 and PEO 1105 in aqueous state, for different concentrations of the polymer.

Conclusions

PEO and Carbopol can be used as matrix for the pharmaceutical product.
The molecular mass has no influence on the local structure of the polymeric matrix.
The repeated action of water does not affect the local structure of the polymeric matrix.

References

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