Biopolymers: tablet manufacturing with hydroxypropyl methylcellulose

Introduction

Hydroxypropyl methylcellulose (HPMC) is a modified cellulose derivative, which is often used as thickener, emulsifier and temperature dependent gelling agent. Contrary to cellulose, it is soluble in water at room temperature. It is completely harmless and can therefore be used in food and pharmaceutical products (E464). At higher temperatures, HPMC falls out and forms a gel-like structure. The temperature at which this happens is called "Lower critical solution temperature" (LCSM). This temperature is dependent on the substitution ratio of methyl to hydroxypropyl and on the HPMC concentration.

General results

Figure 1 shows the evolution of the elasticity index (EI) as a function of the temperature (+1°C.min^{-1} ramp). The higher this index is, the higher is the elasticity of the sample. The evolution of the EI can be divided in three steps:

1. Elasticity decreases slightly with increasing temperature, following Arrhenius rule.
2. Network starts to form, indicated by a sudden increase of the elasticity index. The higher the HPMC concentration is, the lower is the temperature at which the gel starts to form.
3. Gel undergoes a syneresis (contraction). The higher the HPMC concentration, the stronger is the network, and the higher is the syneresis temperature

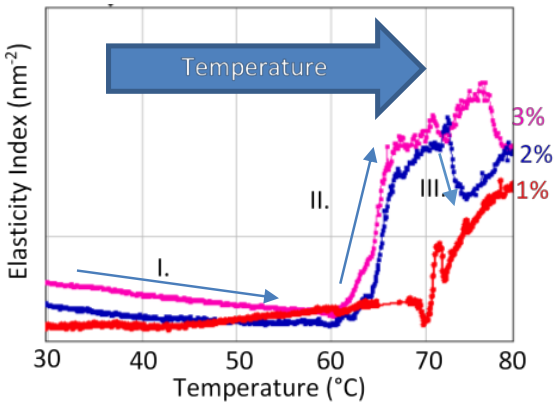

Figure 1. Elasticity Index (EI) as a function of T during a 1°C.min-1 increasing ramp for 3 HPMC concentration.

Figure 2 shows the evolution of the elasticity index as a function of temperature for different concentration of NaCl at a constant HPMC concentration of 2 wt%. The higher the salt concentration, the lower is the temperature at which the gel forms. Salt addition also suppresses syneresis to a certain extent. As one can see, the gels are stronger with salt addition.

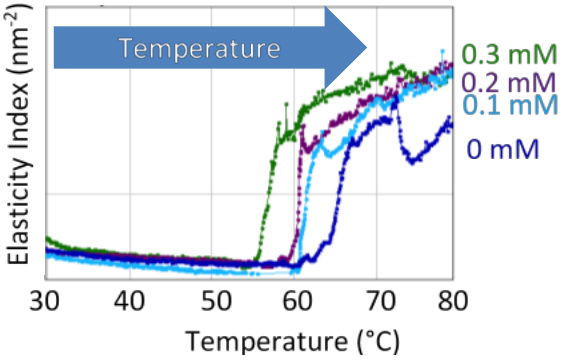

Figure 2. Elasticity Index (EI) as a function of NaCl concentration during a temperature ramp.