GELATION OF MIXED KAPPA AND IOTA CARRAGEENAN SOLUTION

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1. Introduction

Carrageenans are sulfated polysaccharide, obtained from certain species of red seaweeds, and are widely used in food, pharmaceutical, cosmetic industries. κ/ι-carrageenan mixtures undergo two-step gelation, meaning that two components form gel networks independently [1-3]. In the present work [2], rheological and thermal properties of carrageenans were studied. The effect of gelation on water and ion distribution between KC and IC phases was studied by forcing a macroscopic separation across a dialysis membrane.

2. Materials & Methods

Sodium-type κ-carrageenan (KC) and ι- carrageenan (IC) were supplied by MRC Polysaccharide Co. with further dialysis. Carrageenan solutions with fixed KCl concentration were stirred for 30 min at 90°C. After that, hot solutions were mixed another 15min at 90°C to obtain mixtures. Rheological measurement at a frequency of 1 Hz and a strain of 1.0% was on a Hakke Mars II rheometer. And DSC measurements were carried out on a Setaram Micro-DSC VII. Water and ion migration between KC and IC rich phases during gelation were detected by gravimetric analysis and ICP-AES, respectively.

3. Results

Rheological and thermal properties of 2wt% mixed carrageenan under 10mM KCl were studied (Fig. 1) and two-step gelation could be observed.

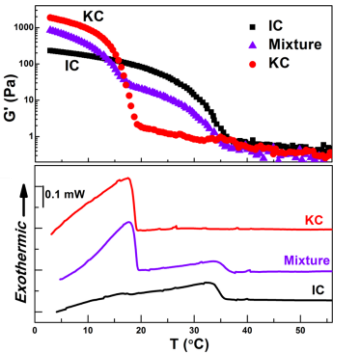

Fig. 1. Rheology (upper panel) and DSC (lower panel) for 2% carrageenan with 10mM KCl with cooling rate of 0.5°C/min.

Furthermore, migration of cations between KC and IC rich phases occurred after storing 10 hrs at 5°C, with increasing KC concentration and the content of K^+ in KC rich phase. At 15 and 20°C, no obvious changes of cation between KC and IC rich phases could be observed regardless of storing time. In addition, NMR results also gave much information on the micro-structure of the mixed system [4].

4. Discussion

It could be observed that KC and IC formed gel structure independently in the mixture. Furthermore, solvent and ion redistribution between KC and IC solutions could occur only after long keeping times at temperatures far below the transition temperatures of the KC.

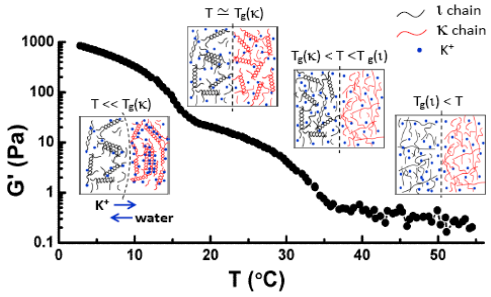

Fig. 2. Schematic representation of water and cation between KC and IC rich phases during gelation.

5. Conclusion

Two step transition temperatures of mixture were almost same to that of individual KC and IC at the same condition. Furthermore, solvent and ion redistribution between KC and IC solutions could occur only after long keeping times at temperatures far below the transition temperatures of the KC.

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