

## Gelation of glucomannan by addition of congo red as observed by small angle X-ray scattering (SAXS)

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### Introduction

Glucomannan is the polysaccharide, which is composed of glucose and mannose with  $\beta$ -1,4 linkage. So far we found the gelation of xyloglucan, which consists of cellulose backbone with xylose or galacto-xylose as a side chain, by addition of congo red (CR). In this study we found the gelation of glucomannan with congo red. The structural characterization for glucomannan systems was performed by small angle X-ray scattering method (SAXS).

### Experiments

Glucomannan sample with high viscosity was purchased from Megazym Co., Ltd. It is from konjac. The congo red sample was from Wako pure chemical Co. Ltd. The gel samples were repeatedly mixed by mildly heating and/or cooling, to prepare homogeneous gels. SAXS experiments were carried out with SAXES optics installed at BL-10C in Photon Factory.

### Results and Discussion

Glucomannan in aqueous solution can form gel by addition of small amount of congo red. Their interaction is weaker than in the case of xyloglucan according to spectroscopic measurements.

Figure 1 shows the Kratky plots ( $q^2 I(q)$  vs  $q$ , where  $I(q)$  is scattering intensity and  $q$  is the magnitude of scattering angle) for glucomannan 3% aqueous solution without and with congo red. The glucomannan does not have good solubility for water. So the large aggregate can be found at nano-level as observed in the upturn around smaller  $q$  region. The upturn disappeared by the addition of congo red. This behaviour indicates that the original aggregate dissolved and then reconstructed to other type of aggregation. Figure 2 is the cross-sectional Guinier plots ( $\ln(qI(q))$  vs  $q^2$ ) for Fig. 1. The aggregate is thought to be rod-like structure built by side-by-side aggregation of glucomannan via congo red molecules.

### References

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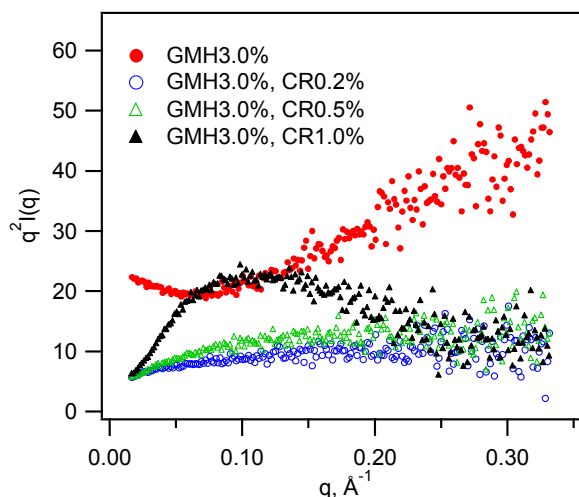


Figure 1. Kratky plots for SAXS from glucomannan (high viscosity) 3% aqueous solutions without and with congo red. CR concentrations are shown in the figure.

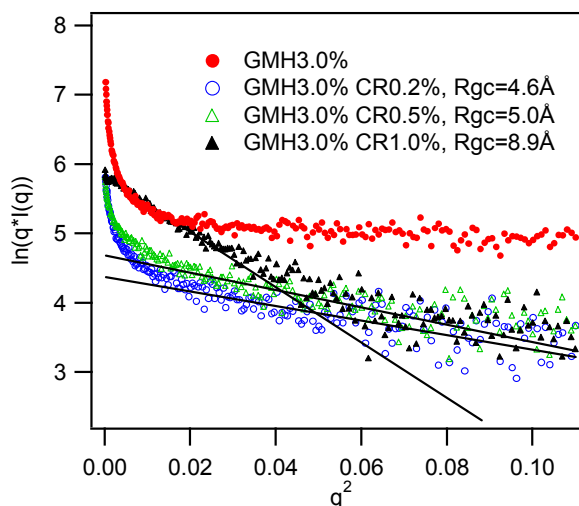


Figure 2. Cross-sectional Guinier plots for SAXS from glucomannan (high viscosity) 3% aqueous solutions without and with congo red. CR concentrations and evaluated cross-sectional radius of gyration,  $R_{gc}$ , are shown in the figure.

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