


(※本報告書は英語で記述してください。ただし、産業利用課題として採択されている方は日本語で記述していただいても結構です。)

	提出日 Date of Report 2012/08/09
課題番号 Project No. 2012A0082 実験課題名 Title of experiment Nano-Structural Analysis of Multi-Sugar type Amphiphilic Oligomer Aggregates 実験責任者名 Name of principal investigator Tomokazu Yoshimura 所属 Affiliation Nara Women's University	装置責任者 Name of responsible person J. Suzuki 装置名 Name of Instrument/(BL No.) TAIKAN / BL15 実施日 Date of Experiment 2012/06/08 10:00 ~ 2012/06/11 10:00

試料、実験方法、利用の結果得られた主なデータ、考察、結論等を、記述して下さい。(適宜、図表添付のこと)
Please report your samples, experimental method and results, discussion and conclusions. Please add figures and tables for better explanation.

1. 試料 Name of sample(s) and chemical formula, or compositions including physical form.

Recently we synthesized novel amphiphilic multi-sugar type oligomers (C_{12} - m GEMA, m : polymerization degree) with dodecyl chain in terminal group and multi-sugar chains [1]. Figure 1 shows the chemical structure of the C_{12} - m GEMA. By employing surface tension measurements, C_{12} - m GEMA was shown to have a higher efficiency in lowering the surface tension of water. In this study, by using small-angle neutron scattering (SANS), we investigated the meso-scale aggregate behavior of the C_{12} - m GEMA in aqueous solution with varying polymerization degree from 3.0 to 7.1.

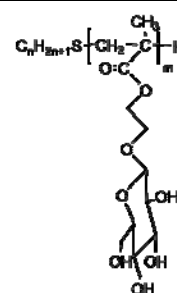


Figure 1.

2. 実験方法及び結果 (実験がうまくいかなかった場合、その理由を記述してください。)

Experimental method and results. If you failed to conduct experiment as planned, please describe reasons.

Experimental:

Amphiphilic multi-sugar type oligomer (C_{12} - m GEMA) solutions were prepared by dissolving the C_{12} - m GEMA lyophilized powder of 25 mg/ml in pure D_2O (Cambridge Isotope Laboratories, Inc.). SANS experiments were performed using the small-angle neutron scattering instrument (TAIKAN) installed at BL15 line at spallation neutrons source, MLF at the J-PARC, Tokai, Japan. The total covered Q range is $0.015 - 3.0 \text{ \AA}^{-1}$. All SANS measurements were performed at ambient temperature. The exposure time for each sample was 3 hours.

Results and Discussion:

Figure 2 shows SANS profiles for C_{12} - m GEMA in aqueous solutions as a function of polymerization degree (m). The present SANS profiles were obtained by a part of small-angle detector bank at $L_2 = 5.56 \text{ m}$. By using the Guinier equation, we estimated the radius of gyration (R_g). The R_g values were estimated to be $17.86 \pm 0.14 \text{ \AA}$ for 3.0GEMA, $18.07 \pm 0.15 \text{ \AA}$ for

2. 実験方法及び結果(つづき) Experimental method and results (continued)

4.0GEMA, $21.16 \pm 0.24 \text{ \AA}$ for 5.1GEMA, $26.91 \pm 0.69 \text{ \AA}$ for 7.1GEMA, respectively. The R_g values were increased with increase in the polymerization degree. At the Q region beyond the Guinier region ($QR_g < 1$), the SANS profile shows a power law behavior defined as $I(Q) \sim Q^{-a}$. According to literature [2], the a -value is becomes larger with increasing axial ratio. The a value were estimated to be -4.07 for 3.0GEMA, -3.95 for 4.0GEMA, -2.90 for 5.1GEMA, -1.96 for 7.1GEMA, respectively. The SANS results suggested that aggregates formed by 3.0GEMA and 4.0GEMA are spherical particles (globular micelles), and with increasing the polymerization degree, the C_{12} - m GEMA aggregates become from globular micelles to non-globular micelles, *i.e.*, ellipsoidal micelles. In order to determine the shape of these micelles quantitatively, the model analysis is now in progress.

References

- [1] Yoshimura et al., in preparation
- [2] Kratky, O.; Pilz, I. *Q. Rev. Biophys.* **1972**, 5, 481.

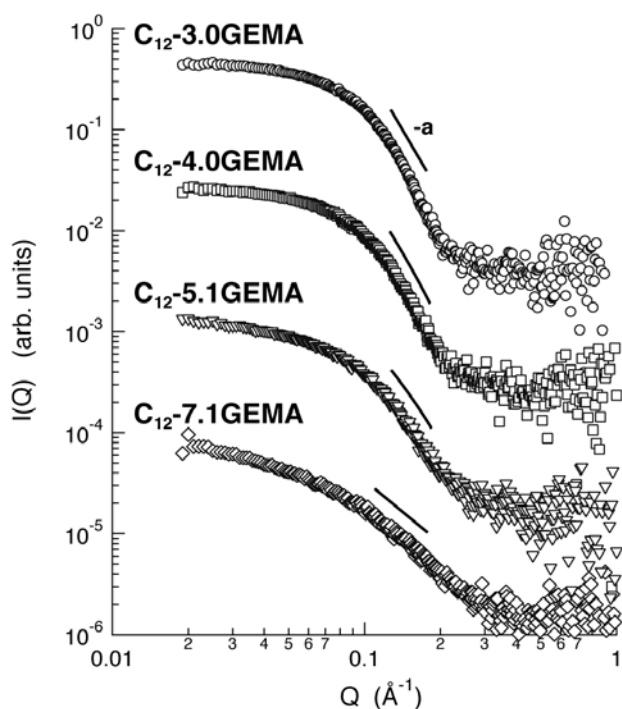


Figure 2. SANS profile for amphiphilic multi-sugar type oligomers (C_{12} - m GEMA) in aqueous solutions as a function of polymerization degree. Each profile is vertically shifted to avoid overlapping.