

Spontaneous Formation of Rod-like Aggregates of Amphiphilic Alternating Alicyclic Copolyimide in Water

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Amphiphilic block polymers, especially those spontaneously form aggregates in water, are potentially applicable for drug delivery systems or nanodispersion of functional materials.^[1] On the other hand, we have reported that amphiphilic *alternating* alicyclic copolyimides (coPIs) can be easily synthesized in one pot on the basis of a unique reactivity of a particular dianhydride.^[2] The amphiphilic coPIs spontaneously formed micelles or vesicles of various size depending on their structures. In this study, we investigated the effect of side chain structure of monomers and happened to find a coPI that forms rod-like aggregate in water.

The structure of coPIs used in this study are shown in Fig. 1. Dynamic light scattering (DLS) measurement of **PI1** did not give reliable result for its diameter while other coPIs having structures related to **PI1** gave the values corresponding to those of unimer micelles. Then we investigated the structure of **PI1** by using transmission electron microscope (TEM), and found that this coPI formed rod-like structures (Fig. 2). It is worth mentioning that the corresponding random coPI nor an alternating coPI having different hydrophilic units did not give such a rod-like structure. This means that the rod-forming nature is quite specific for **PI1** structure.

References

[1] N. Nishiyama, K. Kataoka, *Adv. Polym. Sci.*, **193**, 67 (2006).

[2] K. Kudo, T. Yoshizawa, T. Hamada, J. Li, S. Sakamoto, S. Shiraishi, *Macromol. Rapid Commun.*, in press (2006).

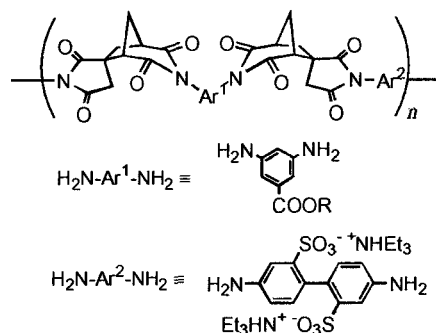


Fig. 1 Structure of alternating coPIs

Table 1. Size of coPI aggregate

	R in NH ₂ -Ar ¹ -NH ₂	Diameter / nm ^{a)}
PI1	-(CH ₂ CH ₂ O) ₄ CPh ₃	N.D.
PI2	-(CH ₂) ₉ OCPh ₃	9
PI3	-(CH ₂) ₁₅ CH ₃	6
PI4	-(CH ₂ CH ₂ O) ₄ H	13

a) Determined by DLS in water.

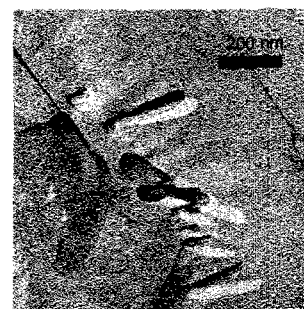


Fig. 2 Cryo-TEM image of **PI1**.

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