MLF Experimental Report	提出日 Date of Report Apr. 20, 2017
課題番号 Project No. 2016B100 実験課題名 Title of experiment Aggregation Structure of Blood-compatible Polymer/Water Interfaces Based on a Simple Impregnation Method 実験責任者名 Name of principal investigator Hisao Matsuno 所属 Affiliation Kyushu University	装置責任者 Name of responsible person Norifumi L. Yamada 装置名 Name of Instrument/（BL No.） SOFIA/BL16 実施日 Date of Experiment Feb. 18-21, 2017

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.

1. Deuterated poly(methyl methacrylate) (dPMMA), $(C_5D_8O_2)_n$
2. Poly(2-methoxyethyl acrylate) (PMEA), $(C_4H_{10}O_3)_n$
3. H_2O
4. D_2O

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.

As a model underlying substrate, dPMMA films were prepared on a quartz block by a conventional spin-coating method from its toluene solution and they were dried in a vacuum oven at 298 K for 24 h. Then, the PMMA films were immersed in 0.5 wt% solutions of PMEA in methanol at room temperature for 2 h in order to impregnate the PMMA films with PMEA. After that, unfixed PMEA chains to underlying dPMMA layers were rinsed by methanol and then the films were dried in a vacuum oven at room temperature for 24 h. The density profiles of the PMEA-impregnate films along the depth direction were examined by neutron reflectivity (NR) measurements. Here, dPMMA was used to enhance the contrast of the scattering length density (b/V) difference between the two components, that is, impregnated PMEA and underlying layer. A Teflon-made reservoir filled with H_2O or D_2O was mounted on the film. Prior to the measurement, the films were measured in air, and then aged in H_2O or D_2O. A beam of neutrons with a wavelength ranging from 0.25 to 0.88 nm at a resolution of 3% was guided into the specimen from the quartz side.

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

The reflectivity was calculated on the basis of the (b/V) profile along the depth direction. The (b/V) values of PMEA, PMMA, dPMMA, SiO_2, H_2O, and D_2O used for the calculation were 1.15×10^{-4}, 1.04×10^{-4}, 7.02×10^{-4}, 3.48×10^{-4}, -0.56×10^{-4}, and 6.38×10^{-4} nm^{-4}, respectively.

Panel (a) of Figure 1 shows q_z dependence of NR for the PMEA-impregnated dPMMA film in D_2O or H_2O. The solid and dashed curves were tentatively best fits to the experimental data on the basis of the model (b/V) profiles shown in panel (b) using the single-PMEA layer model, as shown in panel (c). Table 1 summarizes the fitting parameters. The data indicate that the layer of PMEA formed in the outermost interfacial region of dPMMA film after the impregnation. However, while the χ^2 value for the H_2O case was enough small (7.0×10^{-3}), it for D_2O case showed relatively large value (2.0×10^{-2}). This results clearly means that the single-PMEA layer model could not be applied to the fitting the data acquired under water environments. Thus, further analysis on the basis of other models to obtain the best-fitting. We are proceeding with this.

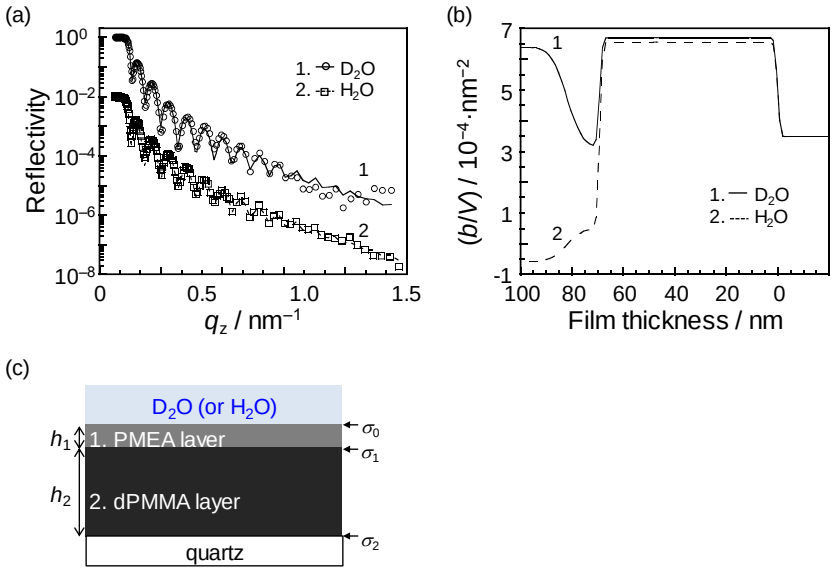

Figure 1. (a) NR curves for the PMEA-impregnated PMMA film in D_2O or H_2O. Open symbols depict the experimental data, and solid and dashed lines are the reflectivity calculated on the basis of (b) the (b/V) profiles of the film in D_2O or H_2O. (c) A schematic illustration of the models used for fitting shown in panel (a).

Table 1. Parameters used to fit the experimental reflectivity for the PMEA-impregnated PMMA film in H_2O or D_2O shown in Figure 1.

medium	$(b/V)_i$ / 10^{-4} nm^{-2}		h_i / nm		σ_i / nm			χ^2
	$(b/V)_1$	$(b/V)_2$	h_1	h_2	σ_0	σ_1	σ_2	
D_2O	3.14	6.69	12.8	69.2	5.0	0.9	0.9	2.0×10^{-2}
H_2O	0.50	6.55	12.8	69.2	5.0	0.9	0.9	7.0×10^{-3}