



JOURNAL OF
APPLIED
CRYSTALLOGRAPHY

Volume 54 (2021)

Supporting information for article:

**Analyses of hierarchical structures in vulcanized SBR rubber by
using contrast variation USANS and SANS**

**Mikihito Takenaka, Shotaro Nishitsuji, Yuki Watanabe, Daisuke Yamaguchi and
Satoshi Koizumi**

Data Correction

According to Choi et al. (Choi et al., 2000), the SANS data I_{CAL} corrected for background of an empty cell, electronic noise of detector, detector sensitivity is given by

$$I_{CAL} = \left[(I_{SAM} - I_{BGD}) - \left(\frac{T_{sample+cell}}{T_{cell}} \right) (I_{EMP} - I_{BGD}) \right] / Sen$$

Here I_{SAM} , I_{BGD} , and I_{EMP} are, measured raw data for sample, an empty sell, and electronic noise of detector, respectively. I_{EMP} was measured with beam being blocked. $T_{sample+cell}$ and T_{cell} are transmission of sample and an empty cell, respectively. We obtained the transmission by measuring the incident beam with the monitor detector (Koizumi et al., 2007). Sen is the normalized detector sensitivity obtained with the measurement of the incoherent scattering of water. In order to estimate the absolute intensity I_{ABS} from I_{CAL} , we measured the standard sample Al sample and calibrated by using

$$I_{ABS} = \left(\frac{I_{CAL}}{I_{STD}} \right) \left(\frac{d_{STD}}{d_{sample}} \right) \left(\frac{T_{STD+cell}}{T_{sample+cell}} \right) I_{ABS,STD}$$

Here, I_{STD} , $I_{ABS,STD}$ are, I_{CAL} for the standard sample and the absolute intensity for the standard sample, respectively. d_{STD} and d_{sample} are the thickness of the standard sample and the sample, respectively. $T_{STD+cell}$ is the transmission of the standard sample.

The incoherent scattering I_{inc} is estimated from the transmission of the samples (Shibayama et al., 2009). I_{inc} is given by

$$I_{inc} = \mu (e^{-\mu d_{sample}} - 1) / (4\pi\mu d_{sample}),$$

where $\mu = -e^{T_{sample+cell}} / d_{sample}$.

2DSANS Pattern

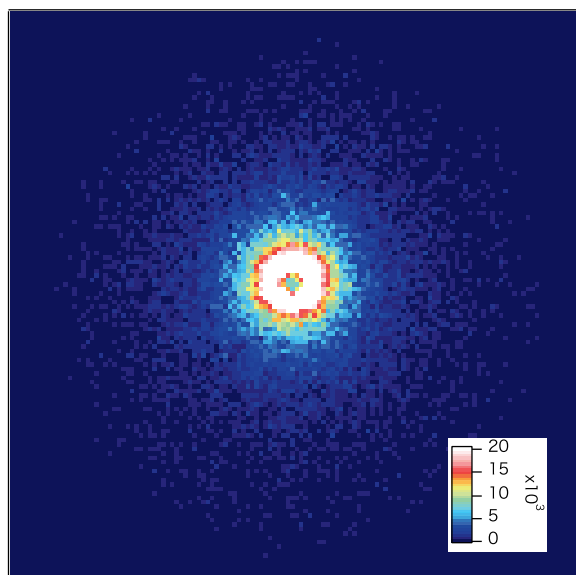


Figure S1 2DSANS pattern of SBR015

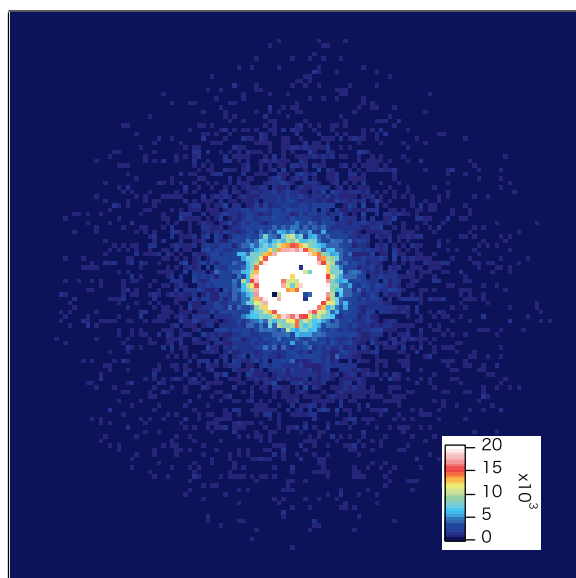


Figure S2 2DSANS pattern of SBR060

Reference

Choi, S. M. (2000). *SANS Experimental Methods. Presented at the NIST Center for Neutron Research Summer School, Gaithersburg, MD*

Koizumi, S.; Iwase, H.; Suzuki, J. I.; Oku, T.; Motokawa, R.; Sasao, H.; Tanaka, H.;

Yamaguchi, D.; Shimizu, H. M.; Hashimoto, T. (2007). *J. Appl. Cryst.* **40**, s474-s479.

Shibayama, M.; Matsunaga, T.; Nagao, M. (2009). *J Appl Crystallogr* **42**, 621-628.