**Sulfur-encapsulation in graphene nanospace**

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1. 背景と研究目的

Small angle X-ray scattering (SAXS) analysis is a facile and useful method to determine structures of non-crystal material. We have prepared two dimensional confined nanospace (PG-box) and encapsulate sulfur into such nanospace. It is of significant importance to investigate the structure of confined sulfur, which is different from its bulk state.

2. 実験内容

We prepared a two-dimensional confined nanobox and encapsulated sulfur into such nanobox. High-resolution, small-angle, synchrotron x-ray-scattering techniques were used to determine the structural information of sulfur inside nanobox. The SAXS patterns of sulfur-contained PG-box was obtained in Aichi SR. The analysis was performed by transforming the SAXS data into Porod plot.

3. 結果および考察

Figure 1 shows the SAXS profiles of PG, PG-box, and sulfur encapsulated PG-box prepared at 500 °C and 580 °C. These represent a method for defining the Porod final slope K, when the intensity scattered by the internal surfaces varies as 1/q^4 plus a constant b that represents local amorphous disorder in the atomic structure, as in a liquid. In this region of the spectrum the intensity is therefore

\[ I(q) = K/q^4 + b, \]

so that by plotting \( I(q)q^4 \) vs \( q^4 \) in a linear scale we should get a straight line with intercept K and slope b. K is important in estimating the internal surface area. In the samples PG and PG-box, the straight line region is not yet reached, but for the other two samples it does seem to be the case. It is notable that in sample S580-PGbox the slope of the curve is zero, or at least very small (this corresponds to the fact that the high q slope for this sample is almost -4). By implication, this sample displays very little liquid-like disorder (although the shape of I(q) at lower q indicates some disorder on a larger scale).