Ikarashi *et al.* Reply: The structural model proposed in our Letter [1] explains well all of our experimental data from high-resolution transmission electron microscopy (HREM), transmission electron diffraction (TED), and grazing incidence x-ray diffraction (GID), whereas the interfacial structures expected from the atom-pump mechanism [2] disagree with our experimental results. Here we will show again the validity of our interpretation of our experimental data.

First, it is extremely unlikely that "a combination of atom-pump phases" would improve the fit with our experimental diffraction data. Our data from the ordered interface show the (2×1) symmetry (our model reproduces the diffraction data very well, and the R factor is 17%) [1]. However, atom-pump phases have (2×2) symmetry, and the intensity distribution among (2×1) spots calculated from each atom-pump phase disagrees with our experimental data [R factors: (31–51)%] [1]. In addition, the disagreement is caused by an atomic configuration common in all of the phases [1]. Therefore, in general, a combination of the atom-pump phases cannot reproduce our experimental data. An averaged structure of the atom-pump phases may show a (2×1) symmetry, when all the following conditions are satisfied; all types of phases at the same α value exist on an atomic plane, they have equal area, and they are arranged "in phase." The resulting (2×1) symmetry, however, fits poorly with our experimental data (R factor: 41%). Furthermore, this (2×1) symmetry of the averaged structure is broken by the "antiphase" domains reported by Jesson, Pennycook, and Baribeau [3], resulting in (1×1) symmetry. This (1×1) symmetry of the ordered interface clearly disagrees with all of the diffraction experiments reported so far [1,4]. Therefore, an averaged structure of the atom-pump phases as well as any one of them disagrees with our diffraction data. Thus, if Jesson *et al.* [5] claim that the atom-pump model is valid, they should show exactly what kind of combination improves the fitting with our experimental results, and why such a specific combination occurs. Nevertheless, it is also unlikely that all of the atom-pump phases in a GID observation area are arranged in such a specific way so as to break the (2×2) symmetry and to improve the fitting with the observed (2×1) intensity distribution, since large numbers of the atom-pump domains are included in the observation area; the x-ray coherent length in our experiment is several microns, which is much larger than the domain size of the atom-pump phases deduced in Ref. [2] (smaller than 5 nm).

Second, our experimental HREM images show that black dots for Si (or Si-rich) atomic dumbbells are arranged with twice the (110) periodicity at the ordered interface [1,6]. Stimulated images of our model, which was refined by fitting to the GID results, well reproduce the above mentioned characteristic of the experimental images [1]. On the other hand, the simulated images from variants of the atom-pump model do not agree with our experimental images, since small dark spots and smeared out regions appear at the interface in their images [1]; those images are clearly distinct from our experimental images and from the simulated images of our model. In addition, we found that single-phase ordered structures extend over 10 nm in width [6], although Jesson *et al.* claimed that each ordered domain was smaller than 5 nm in width [2]. It is very unlikely that the small domains of atom-pump phases are aligned to appear as a widely extended single-phase ordered interface. Therefore, it is evident that the interfacial structure observed in our experiment is different from that produced by the atom-pump mechanism. The small domain size observed in the Z-contrast experiments could have resulted from noise in the images. In interpreting high-resolution images (including Z-contrast images), noise from ion milling artifacts should be considered since the noise narrows the field of view and changes lattice images. Using an improved specimen preparation technique, we removed the artifacts and observed clear lattice images with a wide field of view [5]. Hence, to investigate details of interfacial structures, the influence of the noise on the Z-contrast image in Ref. [2] should be examined.

In conclusion, the ordered interfacial structure expected from the atom-pump mechanism does not agree with either our diffraction data or our HREM results, whereas our model does.

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