Poster Presentation

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Structure analysis for Fe-based and Ni-based metal-metalloid amorphous alloys

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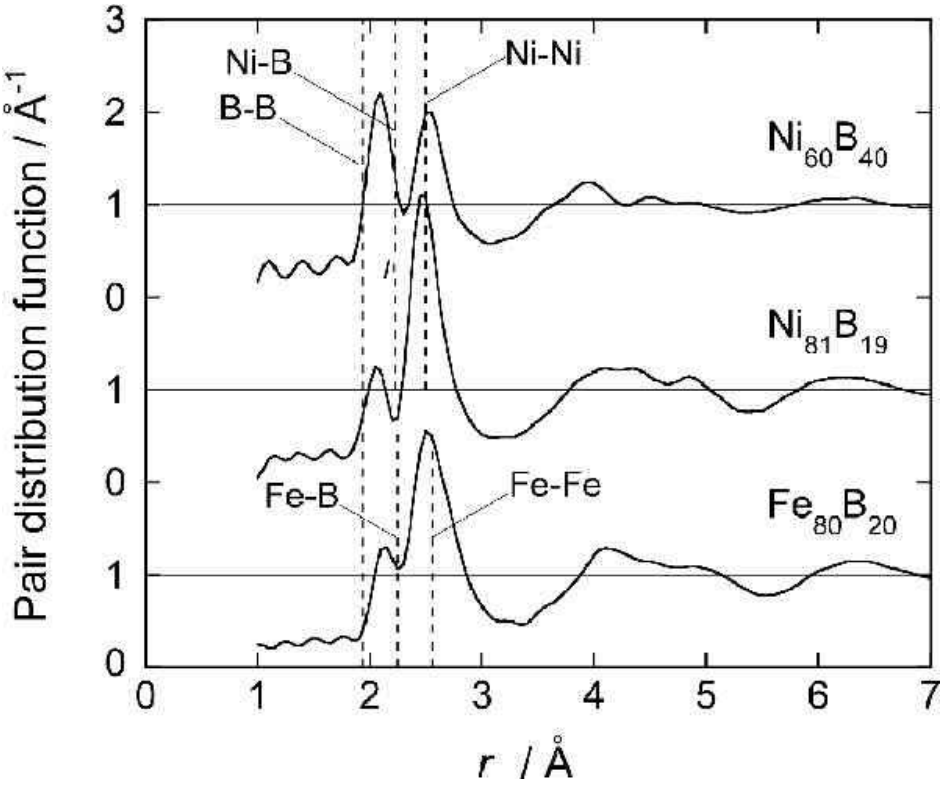
Transition metal-metalloid amorphous systems such as Fe-B and Ni-B are usually applied for the soft magnetic metallic glassy alloys and are counted as one of prominent categories in the field of amorphous alloy technology. Since glass forming ability of these systems correlates closely with the atomic level structure depending on chemical species of metal and metalloid, the local structure analysis for these glassy alloys is strongly required. In order to obtain the reliable structural model for these metal (Fe, Ni)-metalloid (B) amorphous samples, we determined the partial structural functions by combinational use of neutron diffraction (ND) and anomalous X-ray scattering (AXS). The amorphous ribbon samples were produced by the single-roller melt-spinning technique. The AXS measurements at Fe and Ni absorption edges were carried out at BL-7C of Photon Factory, KEK. The ND experiment was performed by using the time-of-flight technique and high intensity total diffractometer, NOVA at MLF, J-PARC. The figure shows the g(r)s for $Fe_{80}B_{20}$, $Ni_{81}B_{19}$, and $Ni_{60}B_{40}$ calculated by the interference functions obtained by ND measurements. The dashed lines in the figure indicate the interatomic distances estimated from Goldschmidt atomic radii (Fe: 1.28 Å, Ni: 1.25 Å, B: 0.97 Å). At the nearest neighbor region up to about 3 Å, the first peak could be accounted for a harmony of metal (M)–B and B–B pair correlations and the second peak is mainly contributed by the M-M pair correlation. As for the three dimensional structural modeling of the amorphous samples, reverse Monte Carlo simulation has been performed starting from an initial model of 2,000 atoms with the b.c.c. structure. The present simulation results are found to reproduce the experimental interference functions obtained by the ND, ordinary X-ray diffraction, and AXS measurements. We will present the obtained structural model and local structural units around B including their arrangement.



Keywords: anomalous X-ray scattering, neutron diffraction, reverse Monte Carlo simulation