Time-of-Flight Pulsed Neutron Diffraction of Pd_<0.8>-Si_<0.2> Amorphous Alloy Using the Electron Linac

Time-of-Flight Pulsed Neutron Diffraction of $Pd_{0.8}$-$Si_{0.2}$ Amorphous Alloy Using the Electron Linac

K. SUZUKI, T. FUKUNAGA, M. MISAWA and T. MASUMOTO

Mater. Sci. Eng., **23** (1976), 215. (Proc. 2nd Intern. Conf. on Rapidly Quenched Metals (Section II), MIT, Cambridge, Mass., 1975)

The structure factor S(Q) of $Pd_{0.8}$-$Si_{0.2}$ amorphous alloy was measured over wide range of Q ($=4\pi \sin\theta/\lambda$) up to 40 A^{-1} by time-of-flight neutron diffraction using pulsed epithermal-neutron generated from the Tohoku University electron linac. The S(Q) has definitely shown an oscillation even in range of $Q \gtrsim 25$ A^{-1}. The 1st peak of the pair distribution function Fourier transformed from the S(Q) has been split into two sub-peaks at the position of 2.42 and 2.81 A. Combining the neutron result with the X-ray result, the 1st sub-peak was verified to correspond to Pd-Si pair and the 2nd sub-peak the mixture of Pd-Pd pair and Pd-Si pair where Pd atom was substituted with Si atom. The average numbers of the nearest neighbour atoms around the Pd atom at origin are 1.7 Si atoms in the 1st sub-peak and 10.7 Pd and 1.5 Si atoms in the 2nd sub-peak. There may be no Si-Si pair with the nearest interatomic distance in the alloy. Such a relation for atom-atom pairs is found in the crystalline Pd_3Si compound, too. The liquid structure of the alloy was also measured and concluded to be essentially close to the amorphous structure except more blurring of peaks.

Propagation of Fatigue Cracks in Amorphous Metals

T. OGURA, K. FUKUSHIMA and T. MASUMOTO

Mater. Sci. Eng., **23** (1976), 231. (Proc. 2nd Intern. Conf. on Rapidly Quenched Metals (Section II), MIT, Cambridge, Mass., 1975)

To clarify the property of fatigue fracture in amorphous metals, observations were made on the propagation of fatigue cracks in amorphous Pd-20 at.% Si alloy sheets (60–65 μ thick). The process of fatigue fracture was revealed to be divided into three stages, i.e., the nucleation of a crack, its gradual propagation, and final unstable fracture. The rate of the propagation (dl/dN) was expressed as

$$dl/dN = CK_I^n, \qquad n \simeq 4$$

where C is a constant.

A plastic zone existed around the fatigue crack, in which a large number of slip lines were concentrated exclusively. The propagation of fatigue cracks on the specimen surfaces occurred along these slip lines, which were not so-called persistent slip bands, but ones having a single slip step of about 0.5 μ in height.

Soft Ferromagnetic Properties of Some Amorphous Alloys

H. FUJIMORI, Y. OBI, T. MASUMOTO and H. SAITO

Mater. Sci. Eng., **23** (1976), 281. (Proc. 2nd Intern. Conf. on Rapidly Quenched Metals (Section II), MIT, Cambridge, Mass., 1975)

In rapidly quenched amorphous alloys of $(Fe_{1-x}Co_x)_{80}P_{13}C_7$ and $(Fe_{1-x}Co_x)_{75}$-