15.1-2 QUASI REALTIME STUDY OF (ADIABATIC) DISLOCATION CREATION IN SYNTHETIC QUARTZ NEAR THE α-β PHASE TRANSITION TEMPERATURE (T_c) USING WHITE SYNCHROTRON RADIATION (WSR). By J.D. Stephenson, Fritz-Haber Institut der MPG, Berlin.

WSR X-ray (transmission) topography of the α-β (classical) phase transition and forced dislocation production in (nearly perfect) synthetic quartz wafers (maintained near T_c (583°C)) were obtained using a newly constructed WSR-Topography oven (DESY, Hamburg). In this process the formation of Schottky (and possible Frenkel) point defects increases exponentially with temperature and remains n in quasi-dynamic equilibrium at each steady temperature. Near T_c, abrupt changes from equilibrium (created by mechanical, thermal or electrical induced shock) cause an adiabatic condensation of point defects, vacancy/interstitial clustering and consequent macroscopic dislocations along the crystal's closely packed lattice planes. At low temperatures α-quartz generally exhibits ⟨1120⟩ {0001} basal slip with possible {1011} planar slip at higher temperatures. Both may be associated with component screw dislocations along [0001].

Experimentally, adiabatic condensation of a fraction of the high density point defects (near T_c) was created by rapidly changing the electrostatic (stress) field within the crystal. As an example, Fig.1 shows the creation and subsequent growth of macroscopic mixed edge-screw (bi-nodal) dislocations caused by switched electrode voltages.

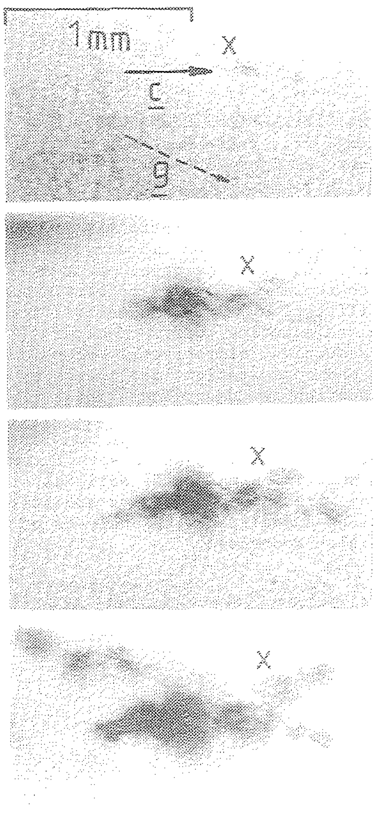

Fig.1

a) T=573°C,-250V

b) T=583°C,-100V

c) T=583°C,-350V

d) T=583°C,-250V

WSR conditions,
3.75GeV,40mA,0.5s

15.2-1 HITACHI BEAM LINE AT KEK FOR EXAFS STUDIES. By Nakano A., Abe O. and Edamura T., 2nd Department, Production Engineering Research Laboratory, Hitachi Ltd., Yoshida-cho 292, Totsuka, Yokohama 244, Japan.

Many kinds of amorphous materials are utilized for electronic devices. Material characterization is inevitable not only to improve the electrical properties of the devices but also to improve the production process, which enables to reduce the cost of the devices.

Hitachi Ltd. has constructed SOR beam lines at KEK Tsukuba, Japan, for research works on the materials and lithography. One of the beam lines is available for EXAFS studies. The arrangement is shown schematically in Fig.1. This beam line is designed for the spectral measurement range of 0.4-12 Å. The optics consist of a bent cylindrical mirror for focussing, a flat mirror for reducing the harmonics and a double crystal monochromator, which 4 kinds of single crystals, beryl(100), InSb(111), Si(311) and Si(422) are available. The block diagram of the EXAFS measuring system is shown schematically in Fig.2. 3 kinds of detectors are applied for EXAFS measurement. Ionization chambers, (IC1, IC2), are specially designed for counting low energy X-ray photons and 3-element SSD enables the saturation intensity of 10^4 cps. Scintillation counter, (SC) and SSD are

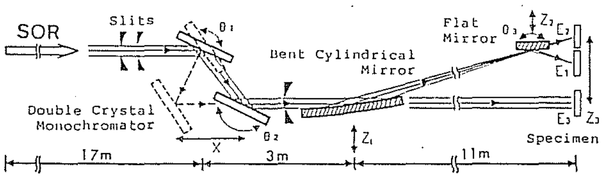

Fig.1 Optics of KEK BL-8B for EXAFS Studies.

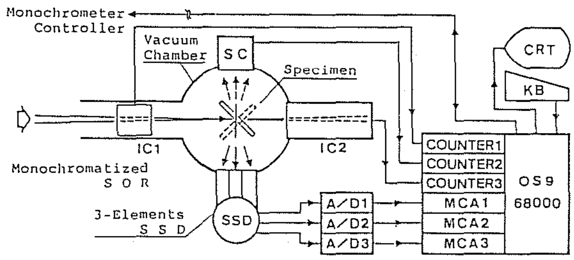

Fig.2 Block Diagram of The Measurement System on BL-8B.

applied for the fluorescent X-ray EXAFS studies, especially for the thin films of the semiconductor devices.

An application to the analysis of the thermal variation of the amorphous material, Ni-P, is shown in Fig.3., which indicates that the heat treatment above 300°C causes the precipitation of Ni crystallite in the plated Ni-P foil.

We express our thanks to Dr. Chikawa and the staff of KEK-PF on their support.

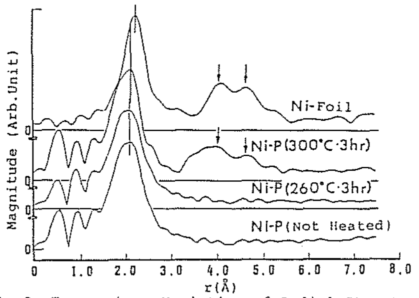

Fig.3 Temperature Variation of Radial Structure