



N. N. Nikul'chenkov¹ A. B. Loginov², S. V. Danilov¹ and B. A. Loginov³

¹Ural Federal University, Ekaterinburg, Russia.

²Lomonosov Moscow State University, Moscow, Russia.

³National Research University MIET, Moscow, Russia

nikolai.nikulchenkov@urfu.ru

Aim of The Work

This study aims to analyze the structure of thin film that partially amorphizing at the heating for the Fe-Si-Cu-Mg-O system using glow-discharge optical emission spectroscopy as an instrument for sample preparation, and probe scanning microscopy for the experiment.

Investigation object

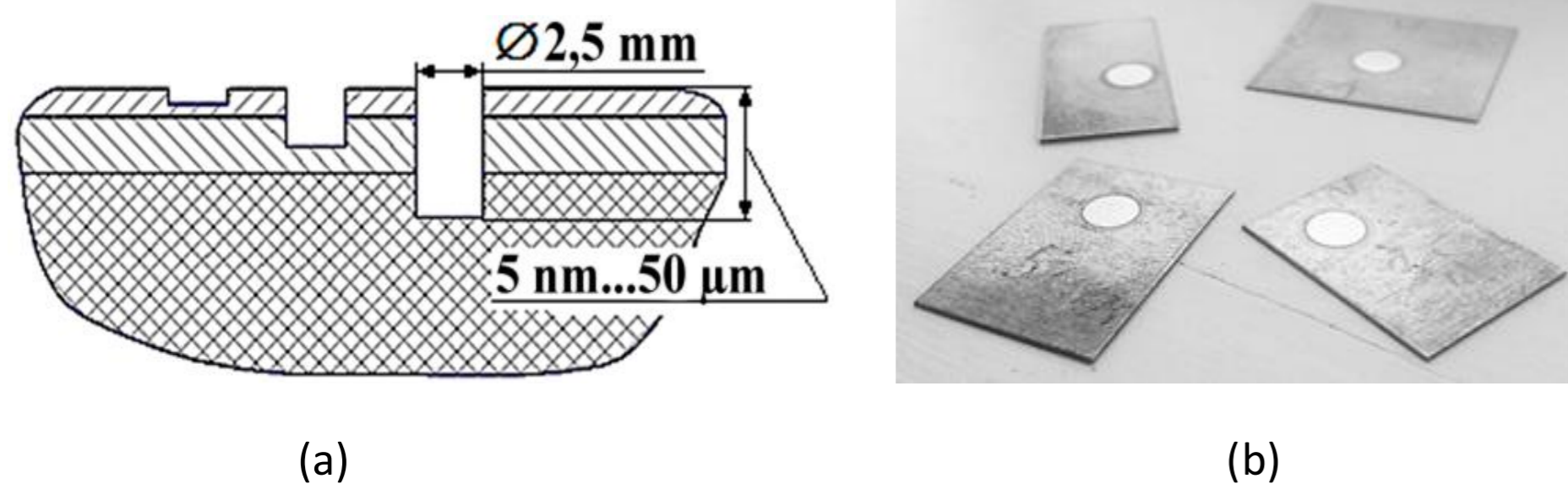


FIG 1. Metallographic surface obtained by glow-discharge optical emission spectroscopy for microscopic investigation in oxidized Fe-3%Si-0.5%Cu after decarburizing annealing; a is the scheme; b are samples after treatment by GDA-750.

The specimen was a cold-rolled band of Fe-3%Si-0.5%Cu alloy with MgO as the thermostable coating after decarburizing annealing.

X-ray Diffraction

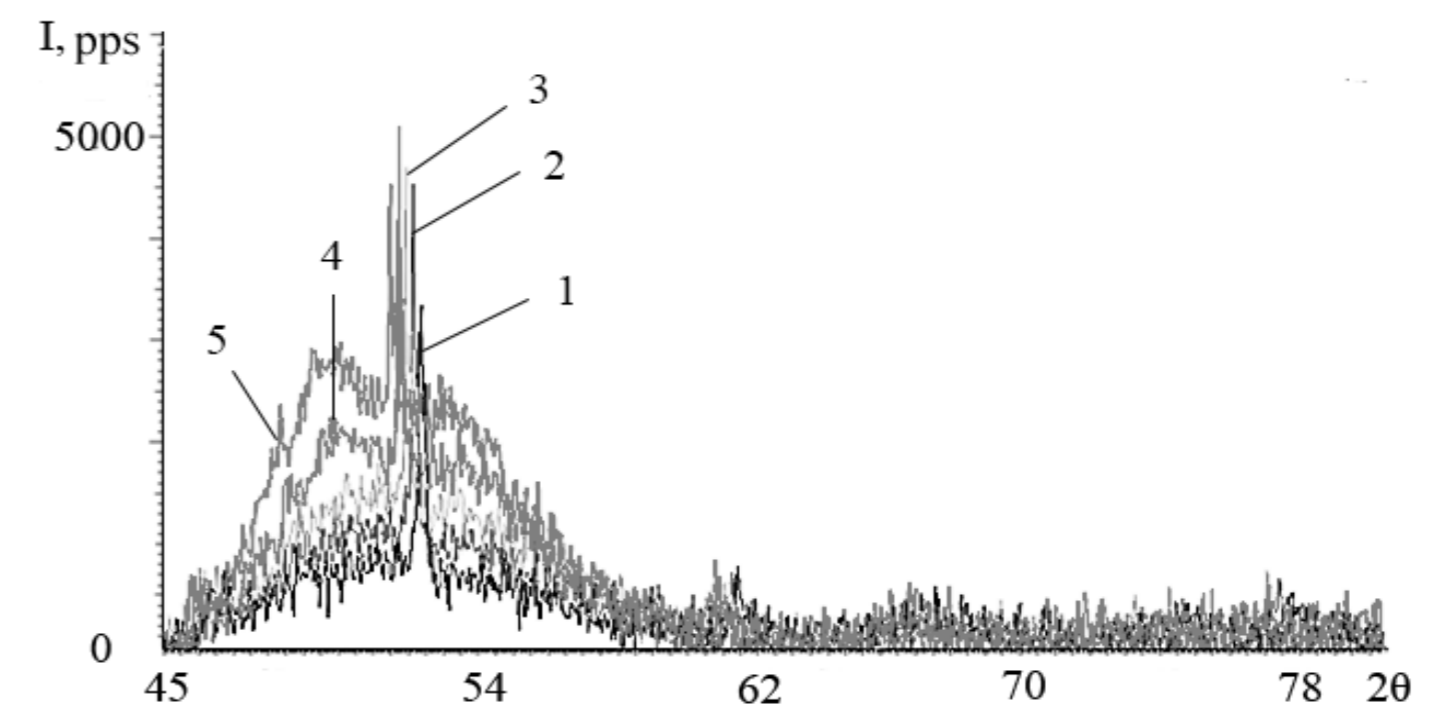


FIG 2. The diffraction pattern of Fe-3%Si-0.5%Cu for different heating temperatures at: 1 – 50 °C; 2 – 300 °C; 3 – 550 °C; 4 – 800 °C; 5 – 1050 °C

For all samples, a halo indicating an amorphous state was found. The halo was extended at temperature elevation. This one was some decreased at 1000–1060 °C and once more at room temperature.

Chemical Analysis by GDA-750 Glow Discharge Analyzer

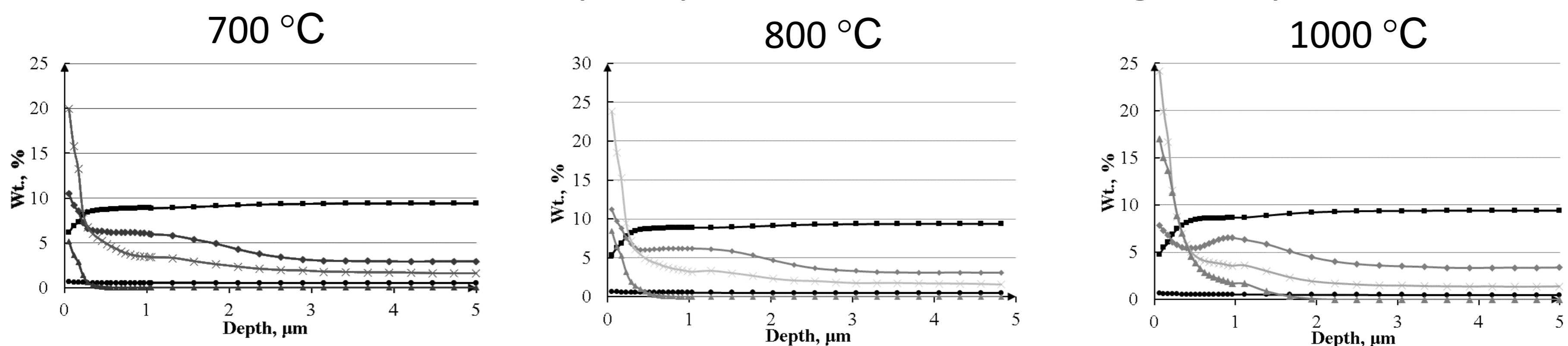


FIG 3. Fe-3%Si-0.5%Cu alloy's surface layer elements distribution with MgO coating, after annealing;
Fe-0.1 — Si — O — Cu — Mg —

Scanning Probe Microscopy

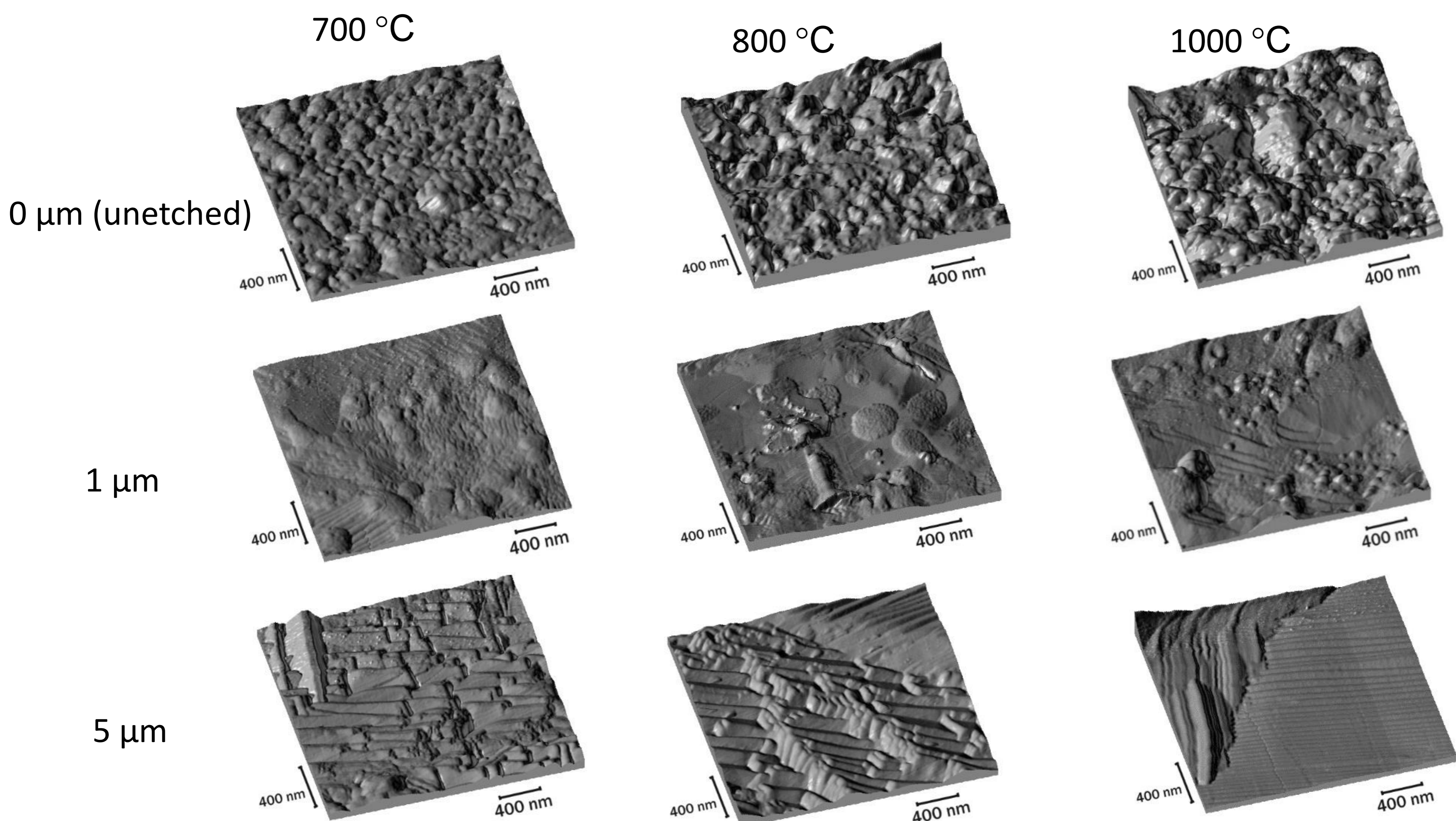


FIG 4. The surface structure after annealing at certain temperatures and after etching to certain depth

SUMMARY The results of research on thin film (Fe-Si-Cu-Mg-O) amorphization obtained by glow discharge spectroscopy, X-ray diffraction, and scanning probe microscopy of acceptable coherence level are shown.