Studies of Magnetism of Antiferromagnetic Chromium and Exfoliation of Hydrogen-Implanted Silicon Using an X-Ray Microprobe*

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The hard x-ray Fresnel zone-plate-based microdiffraction capabilities at the Advanced Photon Source \cite{Cai2000} have recently been used to study magnetism of low-temperature chromium and exfoliation of hydrogen-implanted silicon. The magnetism of antiferromagnetic chromium has been an interesting topic for many years \cite{Fawcett1988}. Using intensity-enhanced x-ray magnetic scattering, provided by the high photon density gain of the microprobe, we have carefully investigated the magnetic phase transition of the chromium at temperatures between 110 to 130 K. The relation between magnetic and nonmagnetic scattering of the chromium was also studied. Formation of hydrogen bubbles beneath the surface is an early stage of exfoliation of hydrogen-implanted silicon. When the bubble is small, say a few microns, stress in the silicon nearby and local curvature of the silicon above the bubble are generated. Taking advantage of the high spatial resolution of the microprobe, we are able to separate the diffraction from curved silicon above a bubble from the bulk diffraction of the silicon by measuring diffraction profiles when the microbeam is scanned across the bubble. Thus, the lattice strain of the silicon near a bubble can be clearly determined.

References

\cite{Fawcett1988} E. Fawcett, Reviews of Modern Physics, 60, 209 (1988)


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