



Experiment title: Rehybrdization of atomic orbitals under pressure: A high pressure Compton scattering study on silicon

Experiment number:
HE-1582

Beamline: ID15A	Date of experiment: from: 05.11.2003 to: 14.11.2003	Date of report: 08.03.2006 <i>Received at ESRF:</i>
Shifts: 24	Local contact(s): Nozomu Hiraoka, Veijo Honkimäki	

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Report:

The results of this experiment have been published as

J.S. Tse, D.D. Klug, D.T. Jiang, C. Sternemann, M. Volmer, S. Huotari, N. Hiraoka, V. Honkimäki, K. Hämäläinen: "*Compton scattering of elemental silicon at high pressure*", Applied Physics Letters **87**, 191905 (2005)

Abstract:

The electronic structure of elemental silicon has been studied under high pressure using high-energy Compton scattering utilizing synchrotron radiation. The experiment was realized using a special Laue monochromator and a novel assembly of compound refractive lenses. The extremely good focusing enabled us to utilize a Mao–Bell version of the Merrill–Basset diamond anvil cell with a Be gasket up to a pressure of 20 GPa. After the careful subtraction of background scattering, the Compton profile difference for the metastable Si-XII to the Si-V phase was extracted and compared with the theory. The results clearly demonstrate the feasibility and potential of the Compton scattering technique as a complementary tool in the study of electronic structure of materials under high pressure.

