



	<b>Experiment title:</b> Study of the Si L-edge in $\text{Si}_{136}$ , $\text{Na}_8 \text{Si}_{46}$ , $\text{K}_8 \text{Si}_{46}$ , and $\text{Rb}_6 \text{Si}_{46}$ clathrates by x-ray Raman scattering	<b>Experiment number:</b> HE-1481 a
<b>Beamline:</b> ID16	<b>Date of experiment:</b> from: 10.07.2003 to: 14.07.2003	<b>Date of report:</b> 26.02.2004
<b>Shifts:</b> 10	<b>Local contact(s):</b> G. A. Vanko	<i>Received at ESRF:</i>

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**Comment:**

This beamtime was allocated to measure the charge density fluctuation excitation in  $\text{MgB}_2$  by means of inelastic x-ray scattering. Unfortunately, three weeks before starting the experiment we got the information that our proposed experiment has been very recently performed successfully at the Taiwan beamline BL-12XU of Spring8 by P. Chow et al. Their data clearly show the expected charge density excitation along with a distinct energy dispersion and have been presented at the annual APS meeting 2003. Due to this fact we decided to switch our experimental purpose to the x-ray Raman scattering study of the momentum transfer dependence of the Si L-edge of several Si clathrates. The preliminary results of this experiment are described in report HE-1481 a. Furthermore, we measured the Si L-edge in amorphous SiO using the same experimental setup (See report HE-1481 b).

**Report:**

The results of this experiment have been published as:

C. Sternemann, J. A. Soininen, S. Huotari, G. Vanko, M. Volmer, R. A. Secco, J. S. Tse, and M. Tolan, *X-ray Raman scattering at the L-edges of elemental Na, Si, and the N-edge of Ba in  $\text{Ba}_8\text{Si}_{46}$* , Phys. Rev. B **72**, 035104 (2005)

**Abstract:**

X-ray Raman spectra of the Na and Si  $L_{II,III}$  edges have been measured for different momentum transfers at beamline ID16 of European Synchrotron Radiation Facility using the inelastic x-ray-scattering setup with an energy resolution of about 1 eV. The momentum transfer dependence of these spectra is analyzed using a first-principles method that takes into account the particle-hole interaction as well as the final states self-energy effects. As an example for application of x-ray Raman scattering to higher Z elements the Ba N edge of a sample of Ba-doped Si clathrate  $\text{Ba}_8\text{Si}_{46}$ , is presented. The potential of x-ray Raman scattering to measure L, M, and N edges is emphasized and discussed along with the future perspectives of different theoretical approaches.

	<b>Experiment title:</b> Study of the Si L-edge of Si and amorphous SiO by non-resonant inelastic x-ray scattering	<b>Experiment number:</b> HE-1481 b
<b>Beamline:</b> ID16	<b>Date of experiment:</b> from: 14.07.2003 to: 15.07.2003	<b>Date of report:</b> 26.02.2004
<b>Shifts:</b> 5	<b>Local contact(s):</b> G. A. Vanko	<i>Received at ESRF:</i>
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### Report:

The results of this experiment have been published as:

C. Sternemann, J. A. Soininen, M. Volmer, A. Hohl, G. Vanko, S. Streit, and M. Tolan,  
*X-ray Raman scattering at the Si  $L_{II,III}$ -edge of bulk amorphous SiO*, J. Phys. Chem. Solids **66**, 2277 (2005)

### Abstract:

X-ray Raman spectra of bulk amorphous SiO have been measured at energy losses around the Si  $L_{I,III}$ -edges for different momentum transfers at beamline ID16 of ESRF. The spectra are compared with measurements of the  $L_{II,III}$ -edges of Si powder and with results of first-principles calculations for Si and alpha-quartz SiO<sub>2</sub>. Indications of sub-oxidic contributions to the  $L_{I,III}$ -edges are found in the experiment and discussed with respect to the model of interface clusters mixture in bulk amorphous SiO.