A06

# A multi-channel monolithic Ge detector system for fluorescence x-ray absorption spectroscopy

Jerry J. Bucher
*Lawrence Berkeley National Laboratory, MS 70A-1150, 1 Cyclotron Road, Berkeley, CA 94720*

P. G. Allen, N. M. Edelstein, and D. K. Shuh
*Chemical Sciences Division, Lawrence Berkeley National Laboratory, Berkeley, CA*

N. W. Madden, C. Cork, P. Luke, D. Pehl, and D. Malone
*Engineering Division, Lawrence Berkeley National Laboratory, Berkeley, CA 94720*

The design, construction, and performance characteristics of the first monolithic quad-pixel Ge detector specifically for use at synchrotron radiation sources to perform fluorescence x-ray absorption spectroscopy (XAS) is described. The detector semiconductor element has an active surface area of 4.0 $cm^2$ which is electrically separated into four 1.0 $cm^2$ pixels and results in little dead volume. Inspection of the spatial response of the array demonstrates that cross-talk between adjacent pixels is less than 10% for photons that fall within 0.5 mm of the pixel boundaries. The detector electronics system utilizes pre-amplifiers built at Lawrence Berkeley National Laboratory with commercial Tennelec Model TC 244 amplifiers. Employing an $^{55}Fe$ test source ($MnK_{\alpha}$, 5.9 keV), energy resolution of better than 200 eV is achieved with a 4 msec peaking time. At 0.5 msec peaking time, pulse pileup results in a 75% throughput efficiency for an incoming count rate of 100 kHz. Initial XAS fluorescence measurements at the beamline IV wiggler endstations at the Stanford Synchrotron Radiation Laboratory show that detector has several advantages over commercially available x-ray spectrometers for the intended low-level counting applications.