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High-resolution multielement solid-state detectors

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Recent advances in multielement solid-state detector systems for high rate, high resolution x-ray spectroscopy will be described. A 16-channel silicon detector system, designed and built at BNL, has been recently operated at NSLS beamline # X19A, showing an average energy resolution of less than 250 eV FWHM, which is adequate to discriminate the fluorescence trace element against the background of elastically scattered photons in a typical EXAFS application. The overall rate during an EXAFS study of ferrocene was approximately 50 k counts per second. A larger system, with 128 channels, will permit a higher overall count rate: $>10^6$ counts per second. It is shown that in order to achieve high resolution with a solid state detector, special care must be spent in the detector-preamplifier assembly. A low noise detector-preamplifier assembly may be obtained integrating the front-end devices (an FET and/or a feedback capacitor) on the detector itself.