New X-ray Detector Technology at Amptek

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Amptek is the leading provider of detectors and signal processing electronics for X-ray spectroscopy and continues to provide new options in its product line. Focusing on increasing detection efficiency, one major initiative has been to increase both detector area and thickness. Amptek has now developed FASTSDD® detectors with 160 mm^2 active area. Currently, these detectors are being shipped windowless for high vacuum applications. Preliminary data are shown for units with 12 μm Be windows intended for XRF applications and with Amptek's C2 Si_3N_4 windows intended for EDS applications. Complimenting this are newly developed 1 mm thick x 25 mm^2 FASTSDD® detectors. These deliver the same resolution as standard, 0.5 mm thick versions (123 eV typical at ^{55}Fe) but above 10 keV, the intrinsic efficiency increases, ultimately reaching a factor of two higher. FASTSDDs® of 1 mm thickness and 70 mm^2 area are also under development. This presentation will discuss the design and performance of these detectors and will also discuss those applications benefiting most by improved area versus thickness, showing how detection limits are improved.

The thickness emphasis has also been extended to development of 1 mm x 25 mm^2 SiPIN detectors. Although much recent research has focused on SDDs, Amptek's SiPINs remain widely used in XRF applications due to their simplicity and low cost, and the fact that their resolution and count rate performance is sufficient for many applications. A 1 mm thick SiPIN delivers both improved efficiency and reduced electronic noise due to its lower capacitance. It simultaneously improves resolution and efficiency.

A third major emphasis has been development of a beryllium-free window for XRF applications. Amptek plans to introduce a boron carbide window in thicknesses of 2 and 3.5 μm, respectively equivalent to approximately 8 and 12 μm of beryllium. It incorporates no supporting grid and use aluminum to block light. Fabrication yields a much tighter thickness tolerance than currently available with beryllium, providing a more predictable efficiency. Preproduction samples of these windows are now available, and their design and spectroscopic performance will be presented.