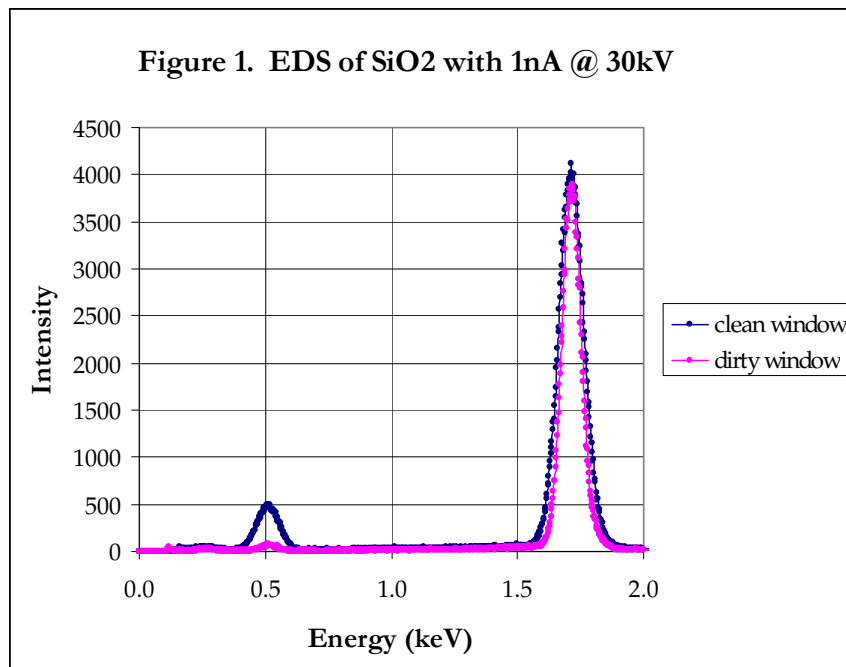


Light Element EDS with LoMAX

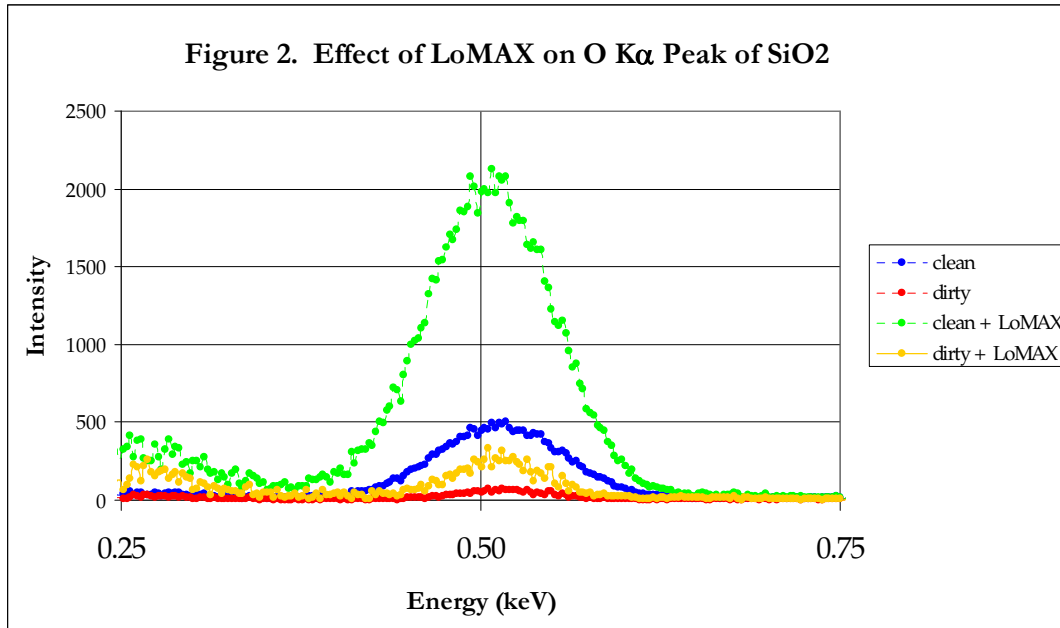
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The detection of light elements with EDS is a challenge because of low-energy X-ray attenuation in the X-ray window. This is further complicated by the adsorption of pump oils and volatile materials liberated by samples. With time, EDS light element sensitivity typically degrades, eventually warranting the warm-up of the EDS to clean the window. An advantage of the low-energy gain of the LoMAX is compensation against adsorption in a dirty EDS window.



The EDS data in Figure 1 shows the acute low-energy attenuation caused by a dirty light-element EDS window. The Si K_{α} intensity is essentially unattenuated, while the O K_{α} is reduced by an order of magnitude. The statistical uncertainty in the 50 cps O K_{α} peak prevented this data from being used as an oxygen standard in quantitative analysis. The user was required to warm the EDS system completely, clean the EDS window with a Freon-analogue, and then recalibrate the system. Such a procedure decreases productivity and risks damage to the EDS window.

The LoMAX provides a nearly linear gain for X-ray energies below 0.75 keV. The LoMAX can be used in two ways: 1) to greatly enhance the performance of a well conditioned EDS, and 2) to recover some of the performance of a poorly conditioned EDS. The data in Figure 2 below shows the performance of the LoMAX on an EDS with both a dirty and clean light-element window. The “LoMAX” data is simulated on the basis of the LoMAX gain characteristics as the experimental data came from a prospective customer.



First, note the one order of magnitude reduction in O K α intensity (from ~ 500 cps to ~ 50 cps) due to adsorbed material on the light-element window. That is a reduction of statistical certainty from about 4% to over 14%, making the oxygen EDS data essentially worthless for quantitative analysis. With the clean EDS system, the LoMAX can increase the statistical certainty of the O K α peak from 4% to 2%. Strikingly, the LoMAX can increase the statistical certainty with the dirty EDS system from 14% to about 6%-- not too far from that of the clean EDS system. At the sacrifice of the Si K α intensity, the LoMAX could placed closer to the sample increasing the O K α intensity further.

Thus, the LoMAX is an essential tool not only for individuals requiring exceptional low-energy performance, but for any EDS user requiring typical light element performance. Given the poorer low-energy performance of SDD detectors over SiLi detectors, the LoMAX is an essential tool—not just a system “enhancement” for those users as well.