TECHNICAL ARTICLE

WHY YOU SHOULD CHOOSE ETP ELECTRON MULTIPLIERS OVER BRANDS "K", "D", AND "B" (FORMERLY BRAND "G")

Most people probably assume that all electron multipliers are alike — commodity products to be purchased from the source with the lowest price. Actually, the right electron multiplier can mean the difference between marginal and optimum performance of your system. ETP Electron Multipliers from SGE are totally unlike any other electron multiplier on the market – in construction, materials, and (most important of all) performance.

Discrete Benefits

All other types of electron multipliers used in mass spectrometry applications are of the so-called "continuous-dynode" type known as channel electron multipliers (CEMs). These devices consist of a single glass tube or a ceramic tube coated with glass material. **Figure 1** illustrates the basic construction of a typical CEM. While mechanically simple, this configuration requires complicated processing to obtain optimum performance characteristics. For example, for devices where higher linear output current is required, a change in process is necessary which may also have an adverse effect on gain vs voltage performance of the device. Most CEM detectors represent a compromise between various performance parameters.

ETP Electron Multipliers from SGE incorporate a "discrete-dynode" configuration (see **Figure 2**). This means that gain, sensitivity, and linear output current requirements may be independently adjusted to produce optimized performance. Changing one performance parameter does not necessarily affect any other! In addition, the discrete construction allows for precise location and geometry of active surfaces to produce highly efficient ion collection optics. This results in detectors with maximum sensitivity and lowest noise.

Figure 1. Typical CEM structure and operation.

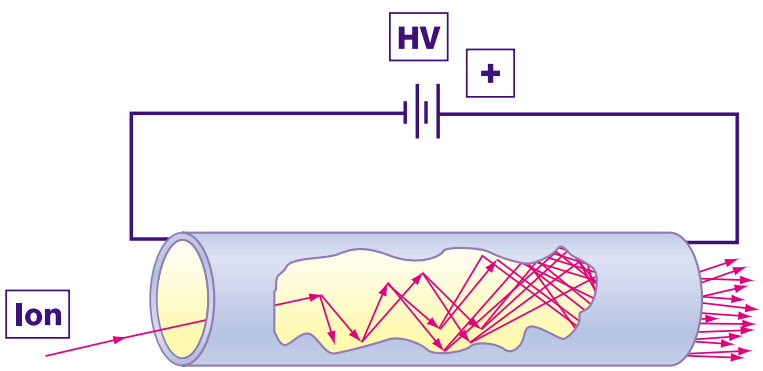
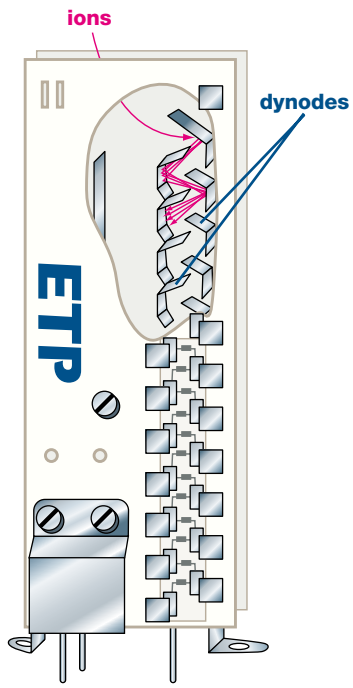


Figure 2. Typical ETP Electron Multipler



Material Advantages

Regardless of what manufacturers claim, all CEMs being produced today (whether brand "K", "D", or "B") rely on a lead-silicate glass system as the active material. Older detectors are fabricated directly from bulk glass tubing while newer types use a small ceramic cartridge to either encapsulate the bulk glass tube or to act as a substrate for a glass slurry which, when processed, forms the active structure. In either case, all CEMs use silica (SiO_2) as the active secondary emissive material. A major problem with all glasses is their tendency to undergo changes in physical and chemical properties with time and exposure to atmosphere, heat, and other environmental changes. This can make the processing of these materials very difficult. The production processes must often be changed to accommodate different batches of material. This in turn frequently results in wide variations in performance and lifetime from product to product.

ETP Electron Multipliers incorporate sophisticated deposition processes to form an active surface consisting primarily of aluminum oxide (Al_2O_3). Al_2O_3 is superior to SiO_2 in terms of ion to electron conversion efficiency and secondary emission. This results in improved sensitivity and signal-to-noise performance. It is also a very robust material that exhibits excellent stability to hostile environments often found in demanding mass spec applications. In addition, Al_2O_3 is extremely stable when repeatedly exposed to atmosphere. Consequently, ETP Electron Multipliers can be kept "on the shelf" for up to two full years with no degradation in performance.

The Performance Edge

Detector performance is a function of ion optical design, materials, and consistency and quality of manufacturing. ETP has developed, over the course of fifteen years, sophisticated computer modelling and simulation techniques to ensure maximum efficiency of our designs. These techniques have been developed specifically for the design and production of electron multipliers and are not available anywhere else in the world. Our wide ***Experience*** (over 50 years combined experience in design and development), and our state-of-the-art ***Technology*** combine to provide you with the best ***Performance*** available anywhere in a mass spectrometer detector. All ETP Electron Multipliers from SGE exhibit:

Unsurpassed Sensitivity:

For example, in the Agilent 5973 MSD, our product has consistently exhibited 60% improvement in sensitivity over the original detector supplied with the instrument.

Unrivalled Dynamic Range and Linearity

The discrete construction and optimized design result in the highest possible linear output current. **Figure 3** shows an example of improved system linearity with an ETP Electron Multiplier as described in the previous issue of Solutions.

Unparalleled Lifetime:

The robust materials used in construction, combined with very large active dynode area, can result in lifetime improvement of from 30% to 600%, depending upon application and use.

Uncompromised Ease of Installation:

All ETP Electron Multipliers are designed for total plug-compatibility with specified instruments. Each detector comes with easy to follow installation instructions and, in case of difficulty, technical support is just a telephone call or e-mail away.

Next time you need a new electron multiplier for your mass spectrometer, think "**Experience, Technology, Performance**" — ETP Electron Multipliers from SGE.

Figure 3. System linearity improvement with ETP Electron Multiplier.