Rapid & Reliable Identification of Asbestos using SEM-EDS

Dr. Maxwell Moyle—ATA Scientific, mmoyle@atascientific.com.au
Carl Strautins—Safe Environments, carl@safeenvironments.com.au
Dr. Guang Li—ATA Scientific, gli@atascientific.com.au

Abstract

The use of Scanning Electron Microscopy (SEM) in conjunction with Energy Dispersive Spectroscopy (EDS) to identify and classify asbestos has recently been incorporated into the Australian Standard for asbestos detection in bulk materials (AS 5370:2024 / ISO 22262-1:2012, MOD). Whilst the technique has previously been employed as a tool for achieving more rapid results with PLM for official confirmation, now SEM-EDS may be used as a fully standardised alternative to PLM.

Methods

Unknown bulk samples were prepared according to AS 5370:2024 before being adhered to SEM stubs with a carbon sticker. The samples were then analysed on the Phenom XL G3 Desktop SEM equipped with an EDS detector for compositional analysis. Fibres were then classified based on the EDS peaks and their intensity ratios, as per the standard. Images of fibres can be automatically acquired across multiple samples, with their locations saved within the software, enabling the swift revisiting of fibres for EDS identification.

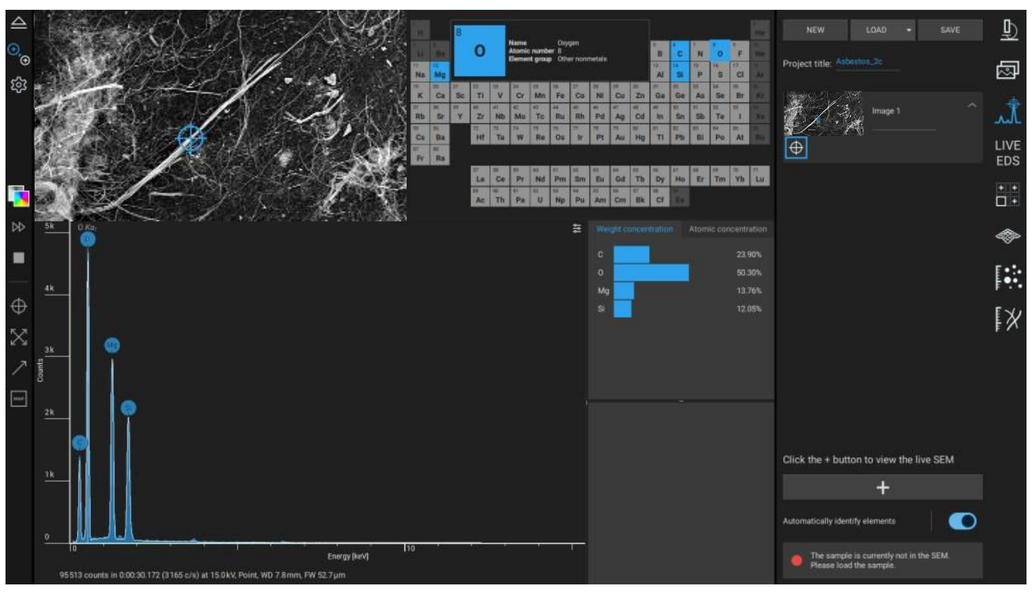

Figure 1. The measurement process; taking an EDS measurement within the Phenom User Interface.

Results

SEM-EDS spectra obtained from the analysis are presented in Figure 3. From the characteristic profile of the spectra, the first fibre was identified as Chrysotile. The second was found not to be regulated asbestos.

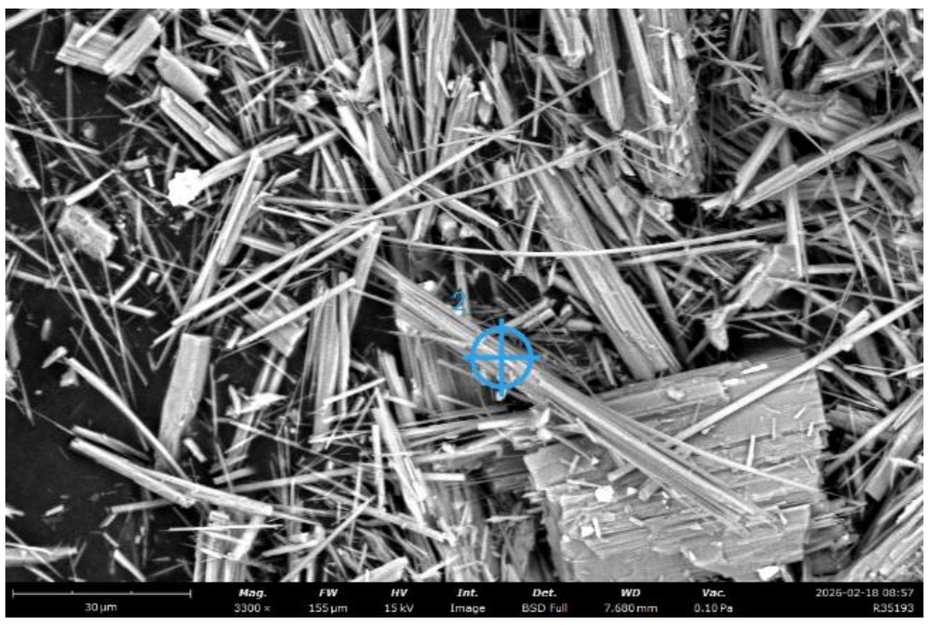

Figure 2. SEM image of an unknown fibre from a bulk sample.

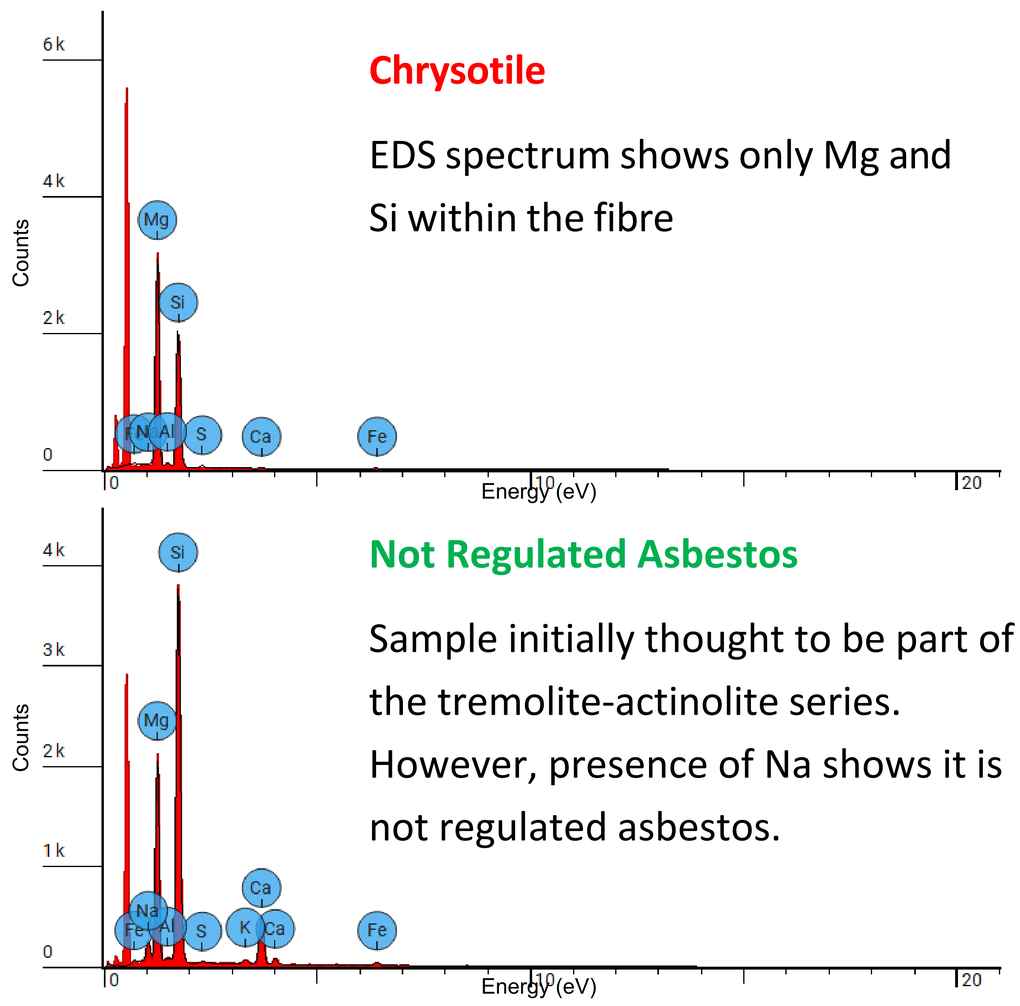

Figure 3. EDS spectra successfully identifying Chrysolite and ruling out the presence of Tremolite-Actinolite.

Conclusions

Recognised within the Australian Standard for asbestos testing in bulk materials, SEM-EDS is a quick, reliable way to classify unidentified fibrous material. As demonstrated by this work, the ease of user analysis requires minimal training. As SEM-EDS does not call for the trial-and-error selection of various RI liquids, the throughput for testing bulk materials can be increased.

Figure 4. The Phenom XL G3 Desktop SEM used in this study.

Reference: Large Chamber SEM | Phenom XL G3 Desktop SEM | Thermo Fisher Scientific - US. (n.d.). https://www.thermofisher.com/au/en/home/electron-microscopy/products/desktop-scanning-electron-microscopes/phenom-xl.html