

Adam Holland¹

William Leigh¹

1. HORIBA UK LTD, Kyoto Close, Moulton Park, Northampton, United Kingdom

adam.holland@horiba.com

Investigating the Size and Chemical Identity of Particulates Formed During Battery Thermal Runaway Using Raman Microscopy

Recent years have seen rapid increases in the demand for lithium ion batteries, particularly as part of the drive towards zero emissions in the automotive industry. Such batteries are susceptible to thermal runaway events, leading to fire and the emission of fine particulate matter. Previous studies have observed the emission of highly toxic compounds from these events¹, and fine particulate matter can negatively impact human health. Particles below 10 μm in diameter are of particular concern as they are more likely to be deposited in the lungs². To fully understand the potential health implications, it is therefore critical to assess the size and chemical identity of the particles produced. In this work we demonstrate the application of Raman microscopy to investigate the chemical identity and particle size of particulate matter produced from an electric vehicle battery fire following thermal runaway. Particles are dispersed uniformly on metallic substrates using a particle disperser, with particles identified and sized using an image segmentation algorithm and Raman spectroscopy performed on all detected particles. Chemical identities of particles are assigned using a spectral library, with over 94% of particles smaller than 10 μm in diameter.

References

- [1] V.Premnath, Y. Wang, N. Wright, I. Khalek, and S. Uribe, *Aerosol Science and Technology*, 56 (2022). 337–354.
- [2] Soares, H. Oliveira, and C. Alves, *Chemico-Biological Interactions* 408 (2025)

Figures

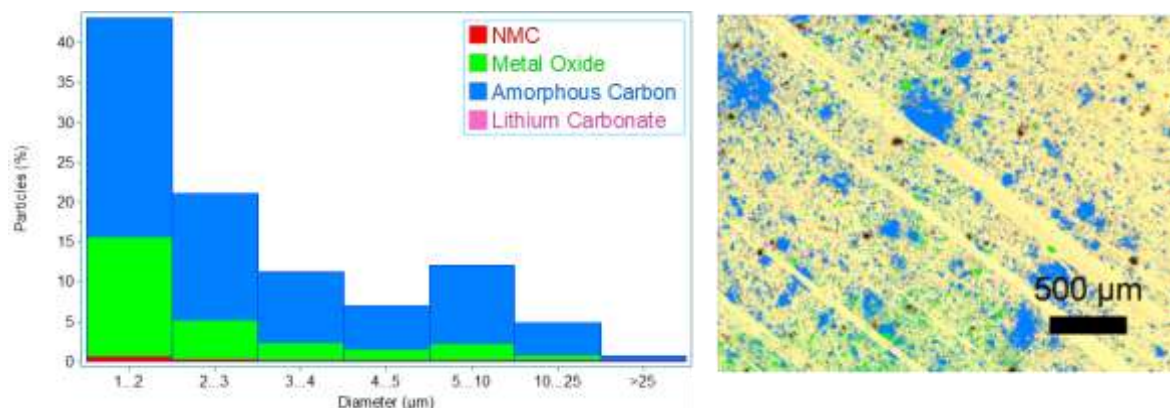


Figure 1: Left: Size distribution and chemical identity of particles. Right: Optical microscope image of the sample with particles coloured by chemical identity.