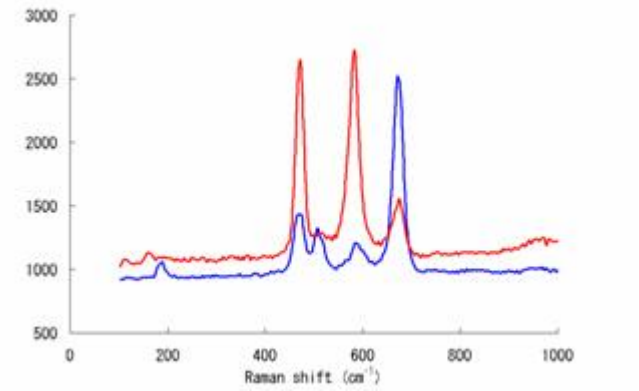
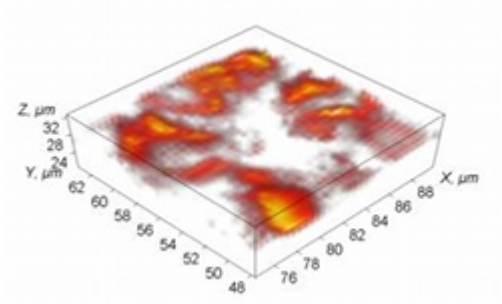
3D Raman image analysis on positive electrode surface of Li-Ion battery

3D Raman mapping on the positive electrode of a degraded Li-Ion battery were done. Distributions of normal electrode material ($LiCoO_2$) and degraded material (Co_3O_4) can be observed in Raman images.

As a material for the positive electrode of Li-Ion battery, $LiCoO_2$ is mainly used. The electrode material, however, degrades after repeated discharge and charge cycles and then some areas of the electrode surface turn into Co_3O_4, which can't contribute to charge. Because these materials show different spectra, material distributions on the surface can be observed with specific peak intensity images (red spectrum: $LiCoO_2$, blue spectrum: Co_3O_4).

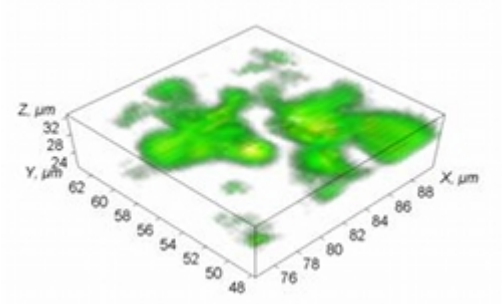


Typical Raman spectra



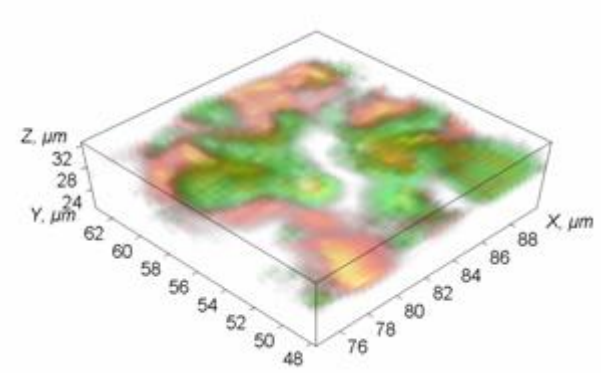
Normal area of the electrode

Raman intensity image at $LiCoO_2$ peak (600 cm^{-1})



Degraded area of the electrode

Raman intensity image at Co_3O_4 peak (700 cm^{-1})



Overlapped (normal and degraded areas) image.

As shown in the upper images, distributions of normal $LiCoO_2$ and degraded Co_3O_4 material are completely different.

Overlapped image from above images.