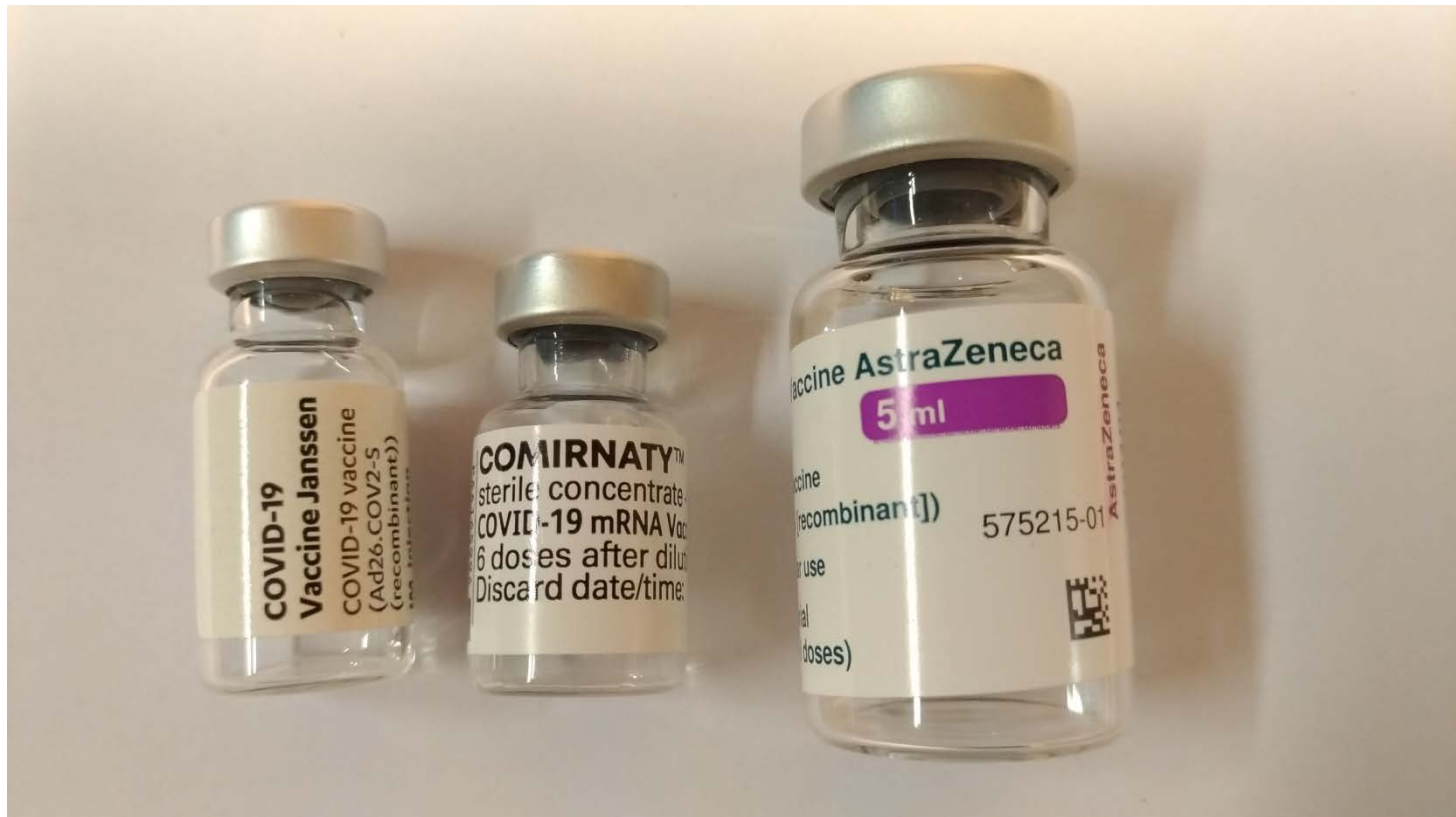
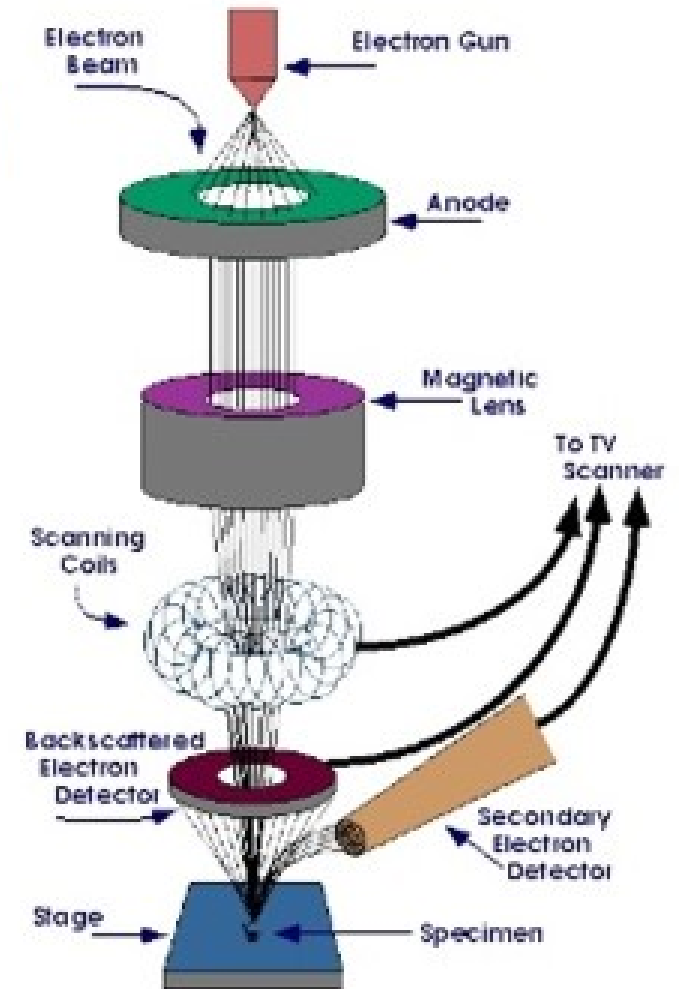


# Astra-Zeneca, Biontech-Pfizer and Johnson&Johnson COVID-19 „vaccines“ investigated by means of Scanning Electron Microscopy (SEM)



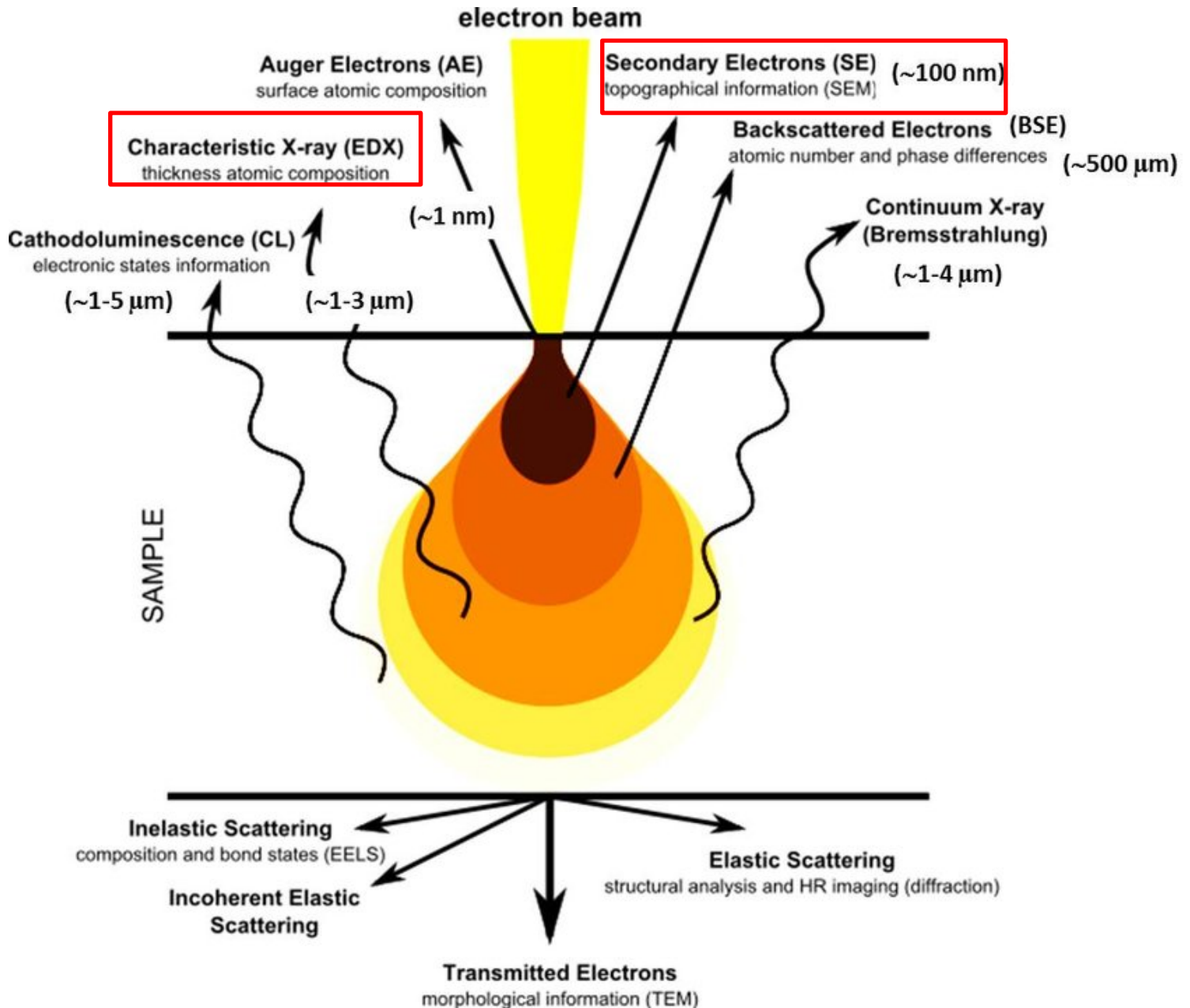
# SEM = Scanning Electron Microscopy

## Scanning Electron Microscope (SEM)

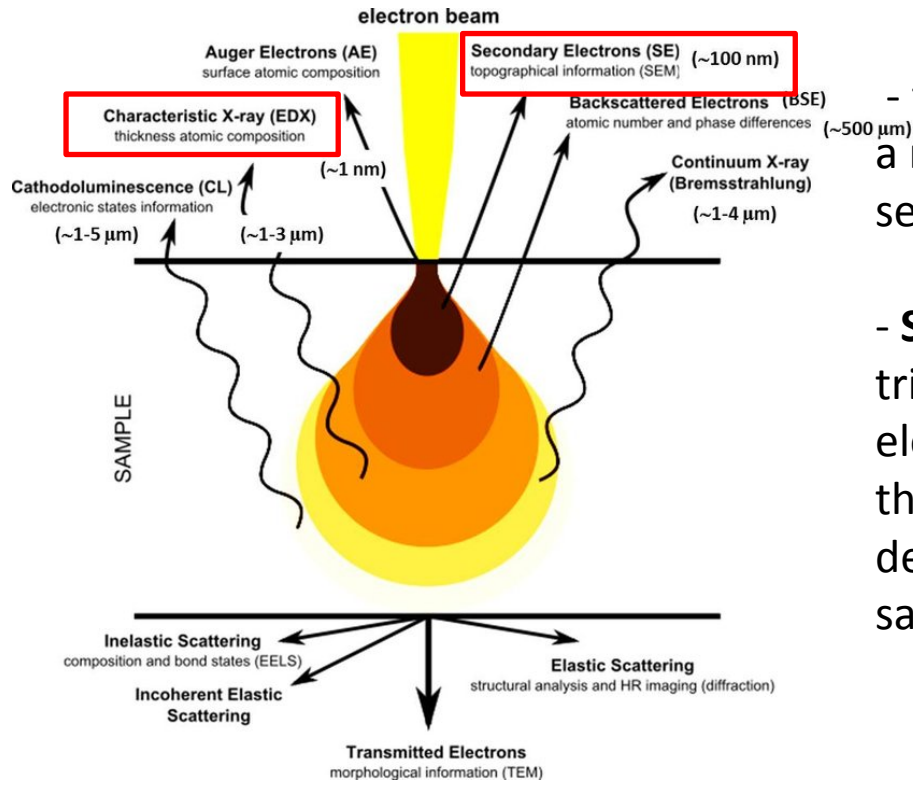


<https://www.biosciencenotes.com/scanning-electron-microscope-sem/>

# SEM = Scanning Electron Microscopy



# SEM = Scanning Electron Microscopy

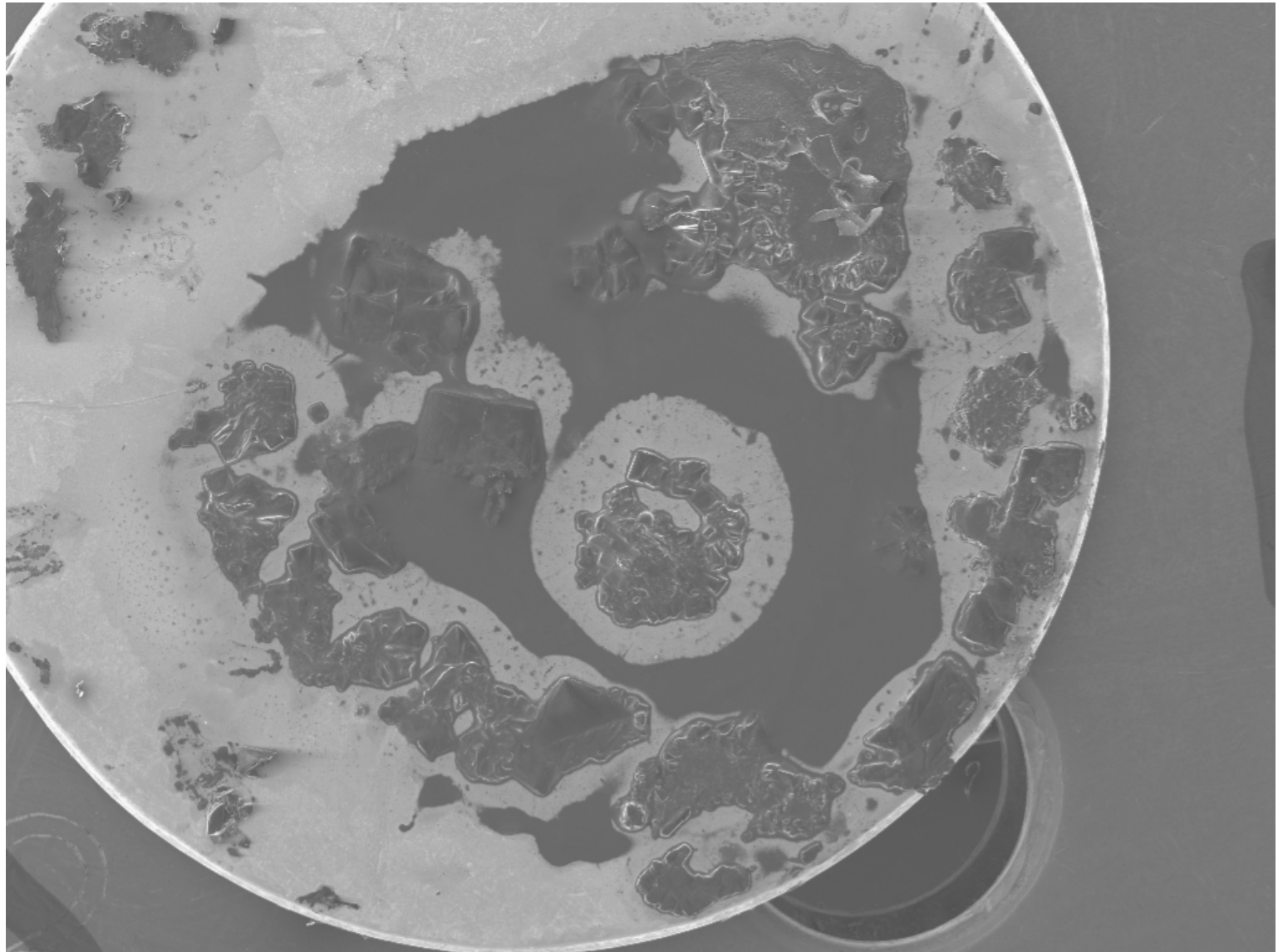


- the sample in question is scanned by means of a narrowly focused electron beam ( $\sim 5-10 \text{ nm}$ ) of several thousand electron volts energy

- **Secondary electrons are low energy electrons** triggered by the primary electrons of the electron microscope by inelastic scattering from the sample, the contrast of the image is mainly determined by the **surface topography** of the sample.

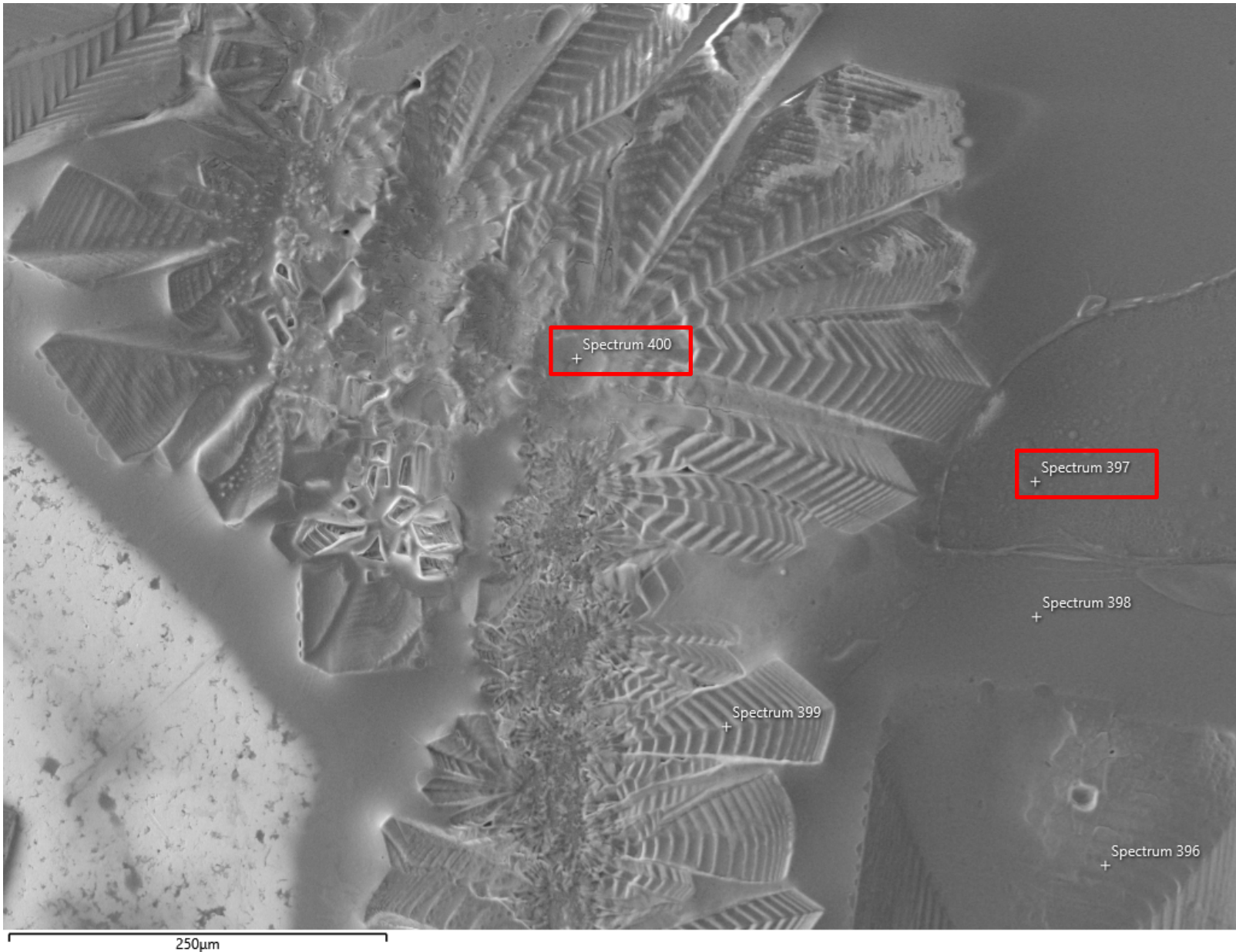
**chemical analysis** can be performed using energy dispersive X-ray spectroscopy (EDX). A detection depth of hundreds of nanometers to a few micrometers is achieved.

# SEM/EDX Analysis of Astra-Zeneca Overview

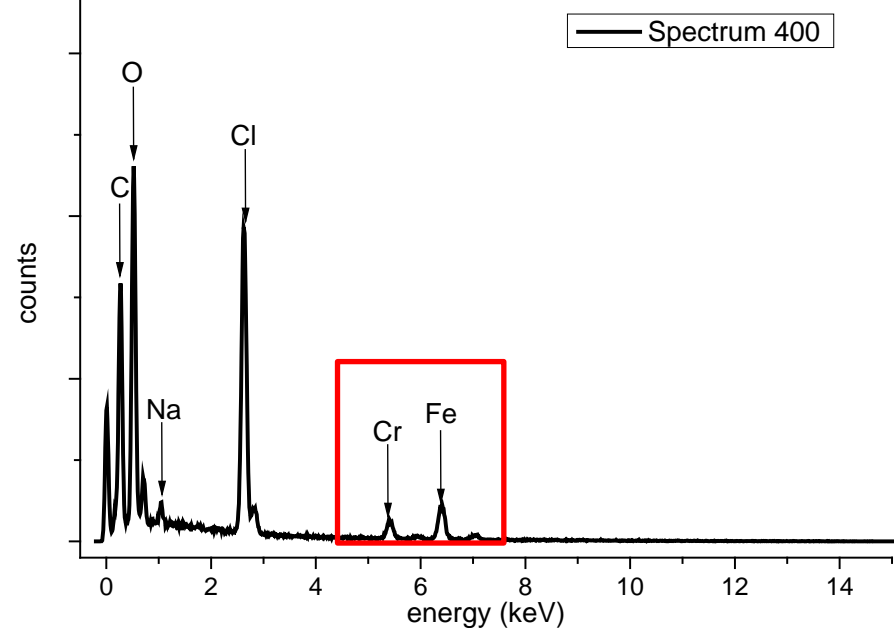
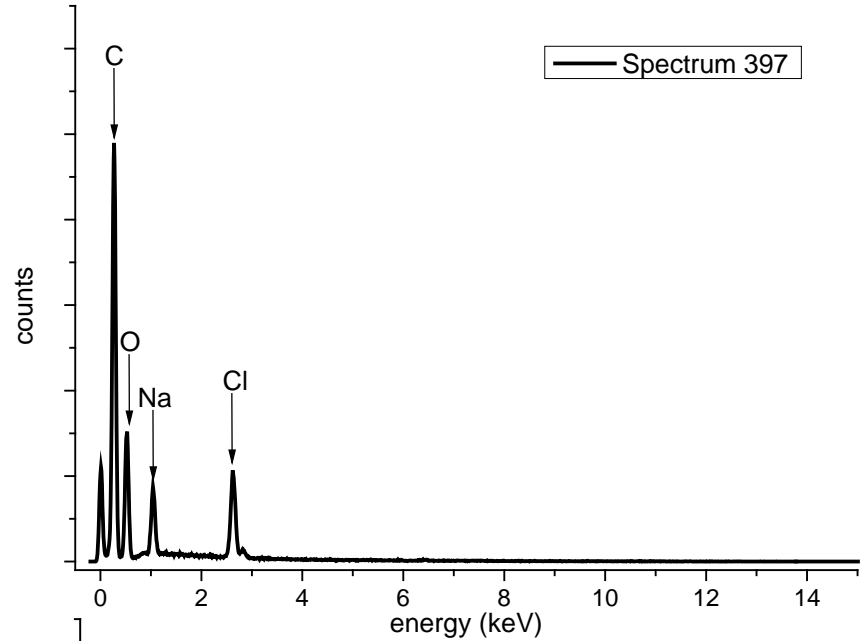
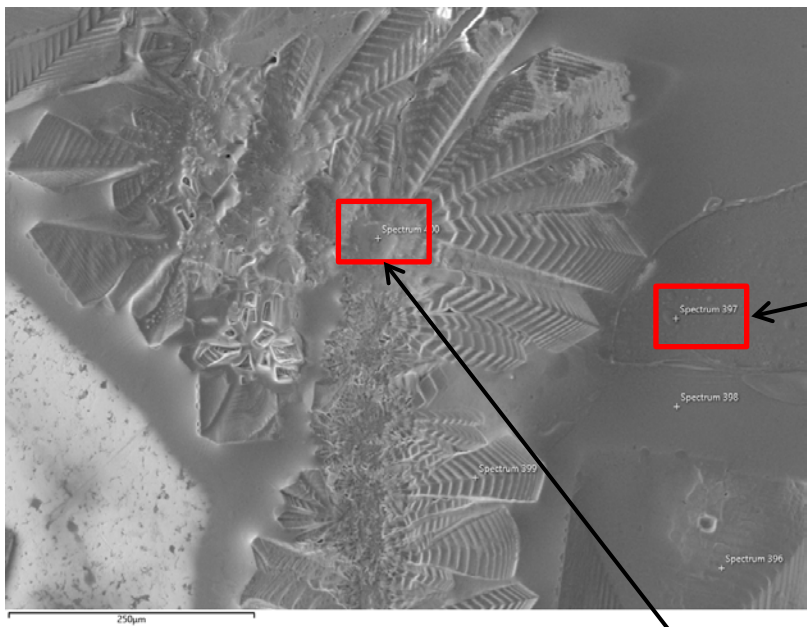


2.5mm

# SEM/EDX Analysis of Astra-Zeneca Region comprising Fe and Cr

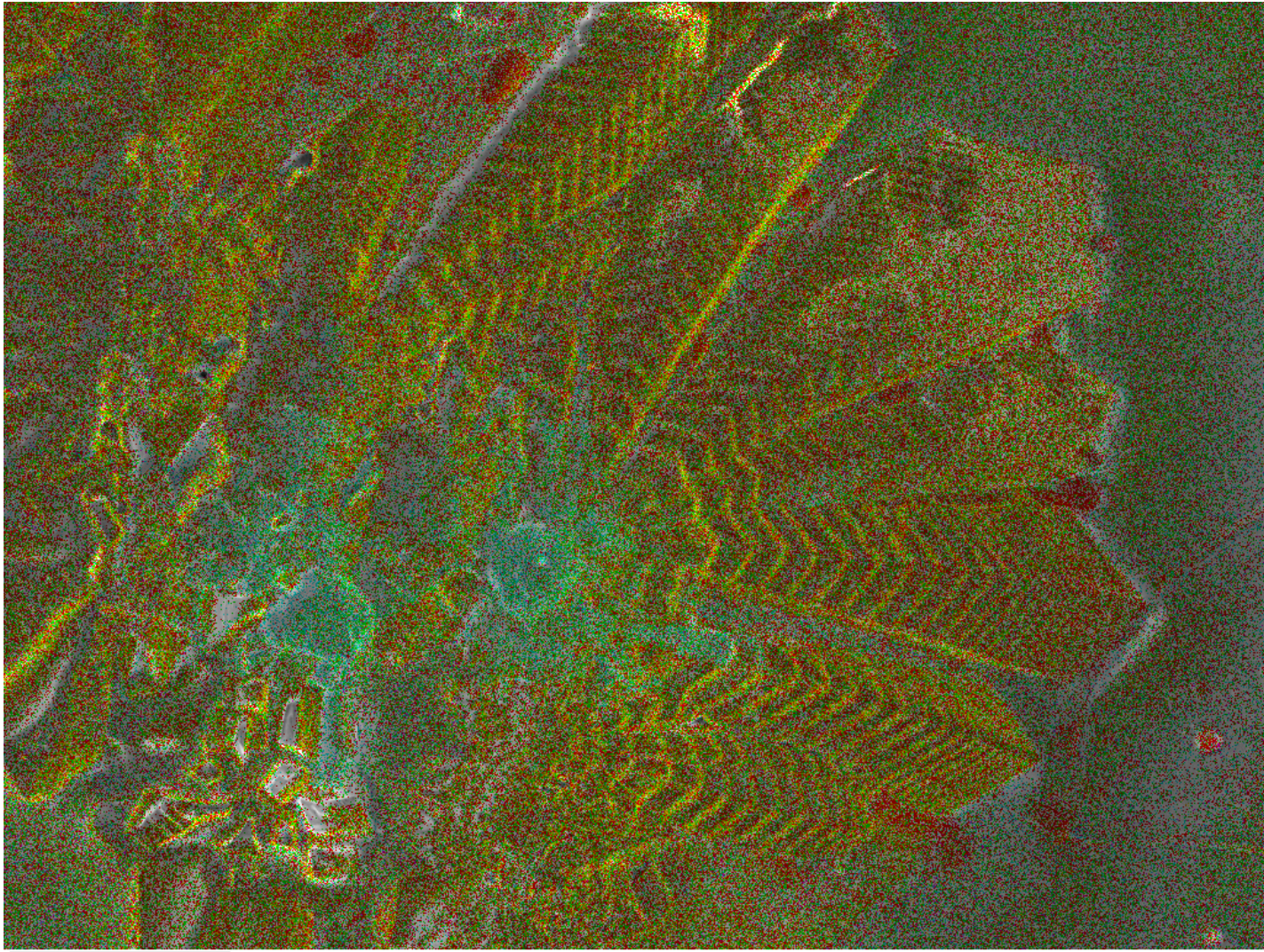


# SEM/EDX analysis of Astra-Zeneca Region comprising Fe and Cr



# SEM/EDX analysis of Astra-Zeneca

## EDX-mapping of spatial distribution of chemical elements

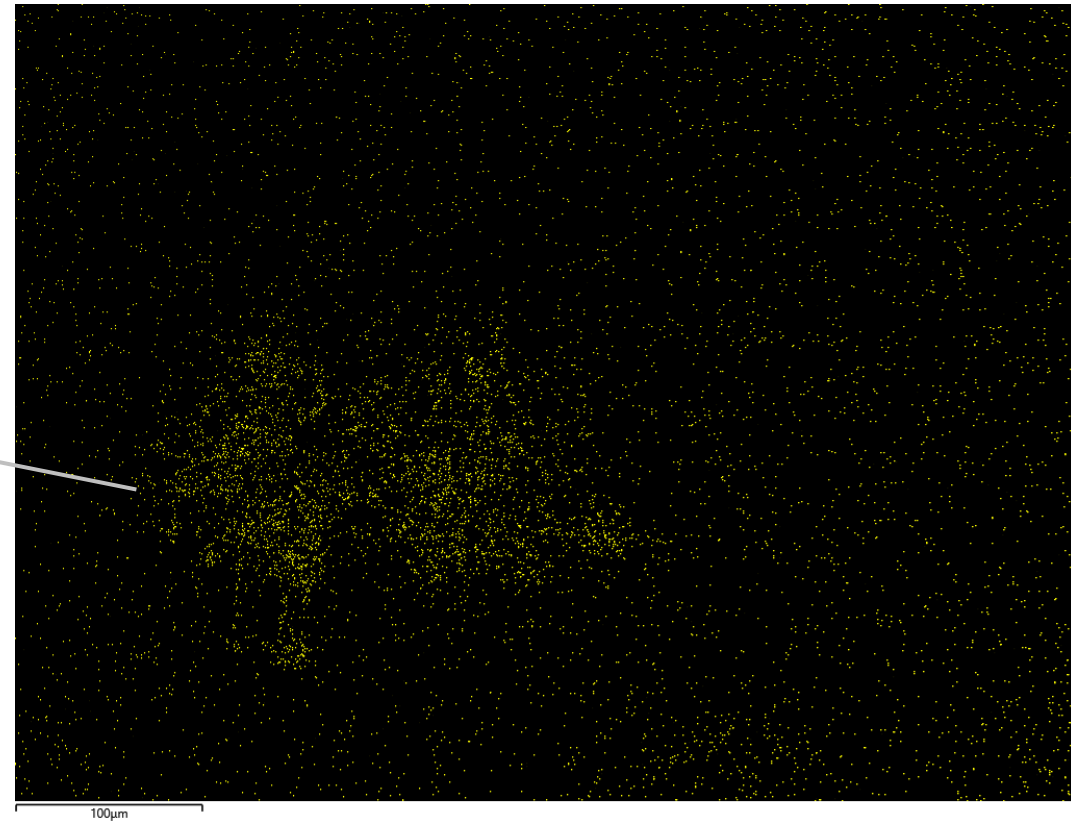
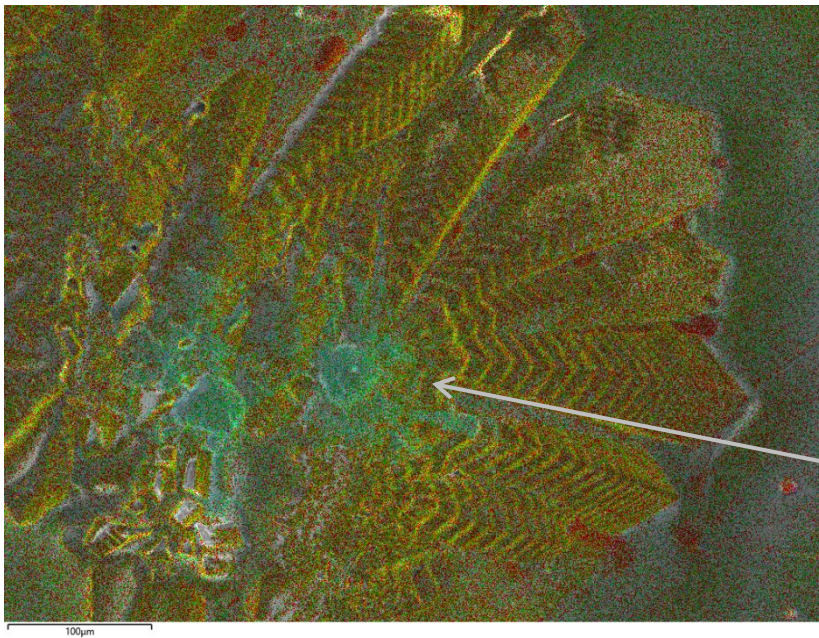


**Layered image: Each color represents a different chemical element**



# SEM/EDX analysis of Astra-Zeneca

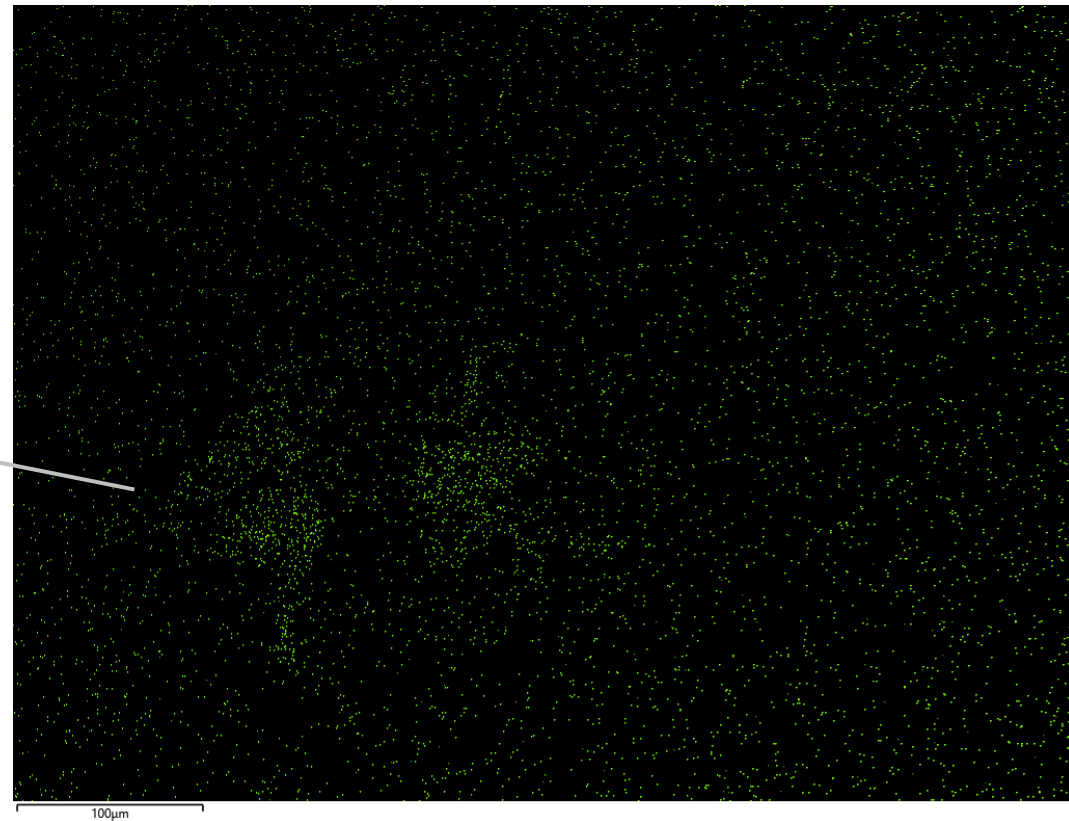
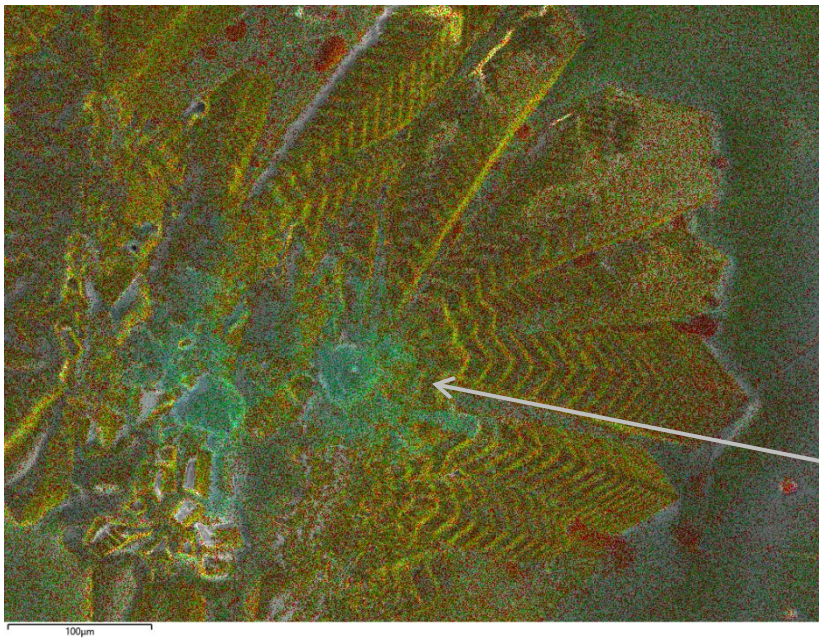
## EDX-mapping of spatial distribution of chemical elements



**EDX mapping: spatial distribution of Fe**

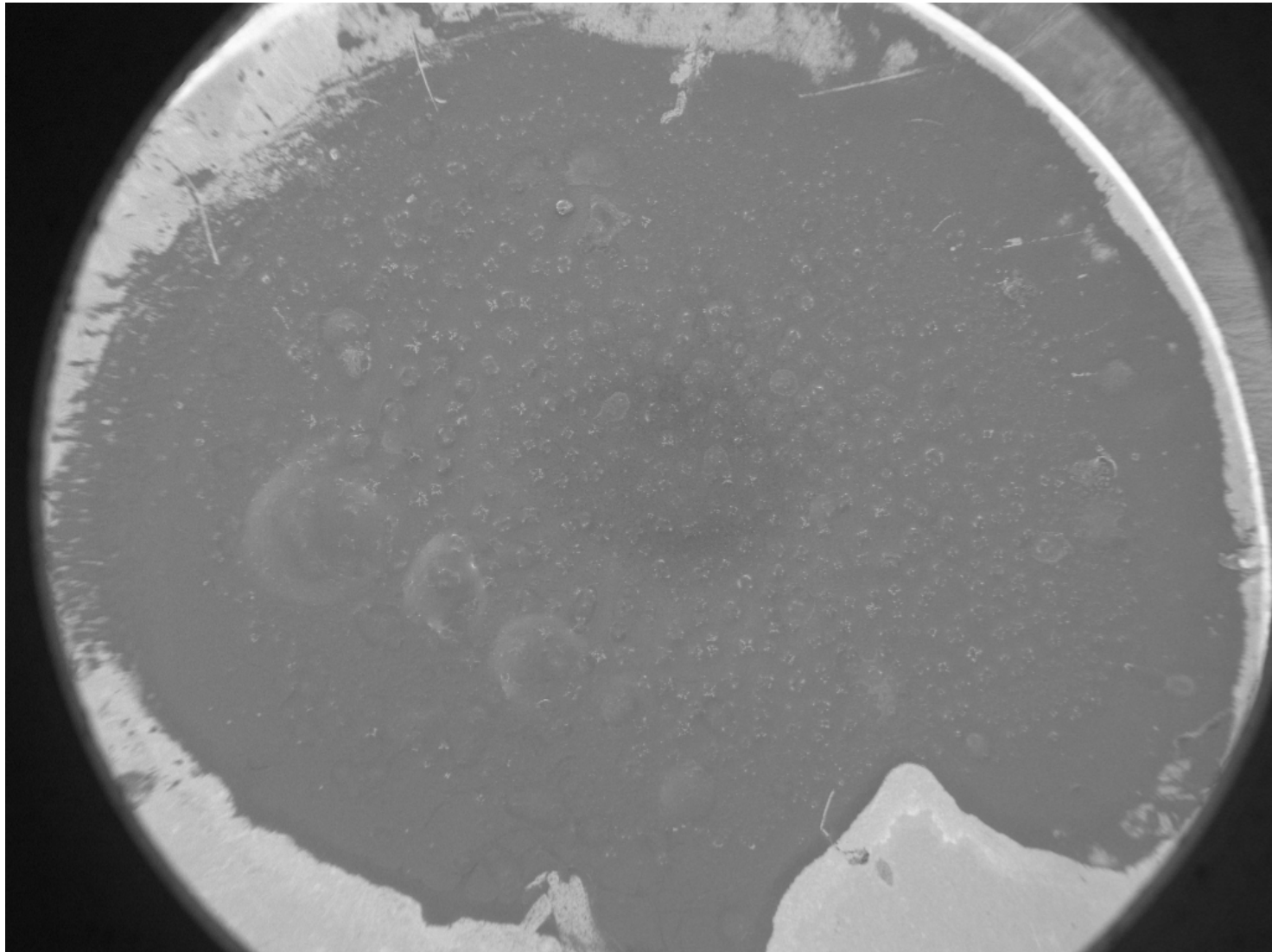
# SEM/EDX analysis of Astra-Zeneca

## EDX-mapping of spatial distribution of chemical elements



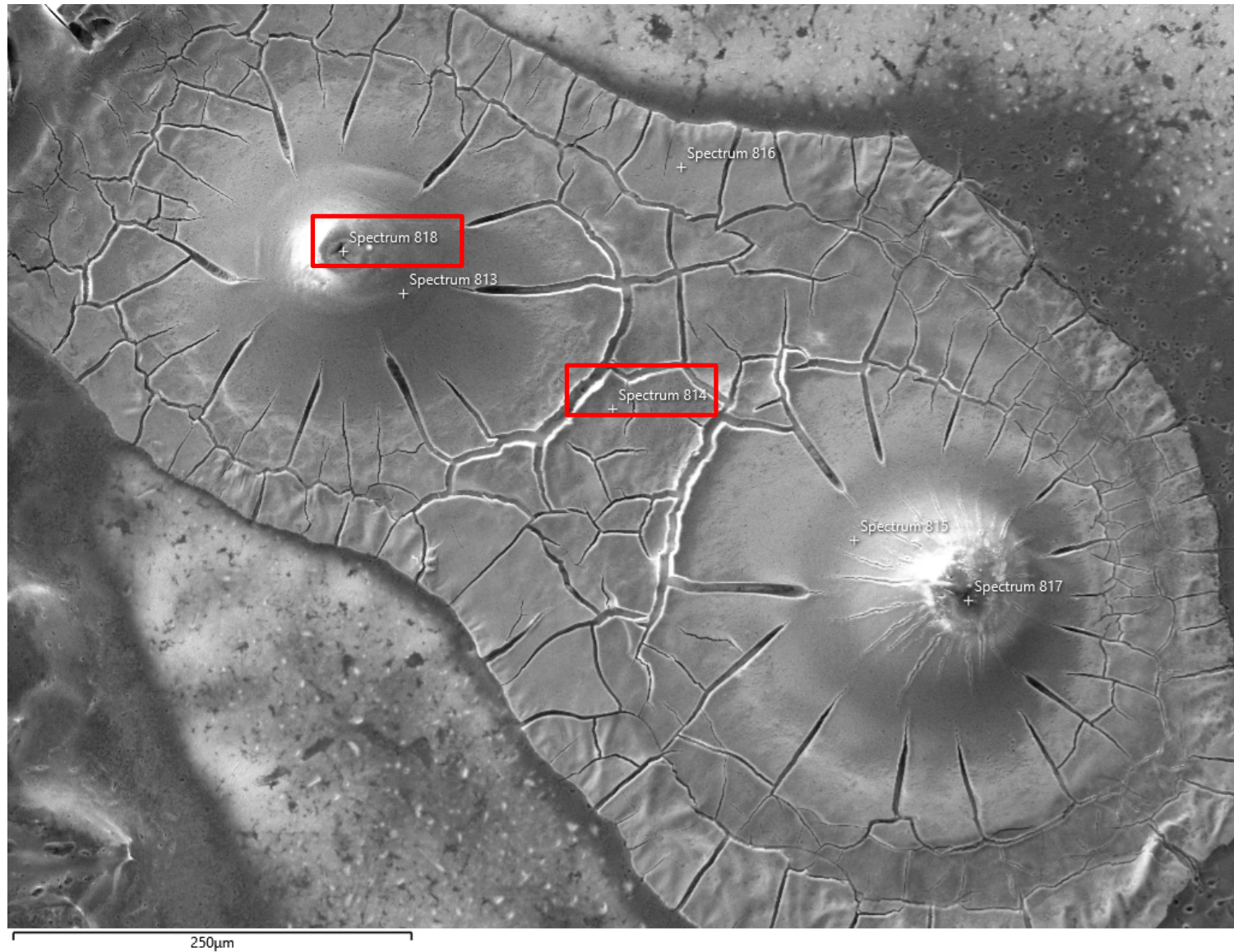
**EDX mapping: spatial distribution of Cr**

# SEM/EDX Analysis of Biontech - Pfizer Overview



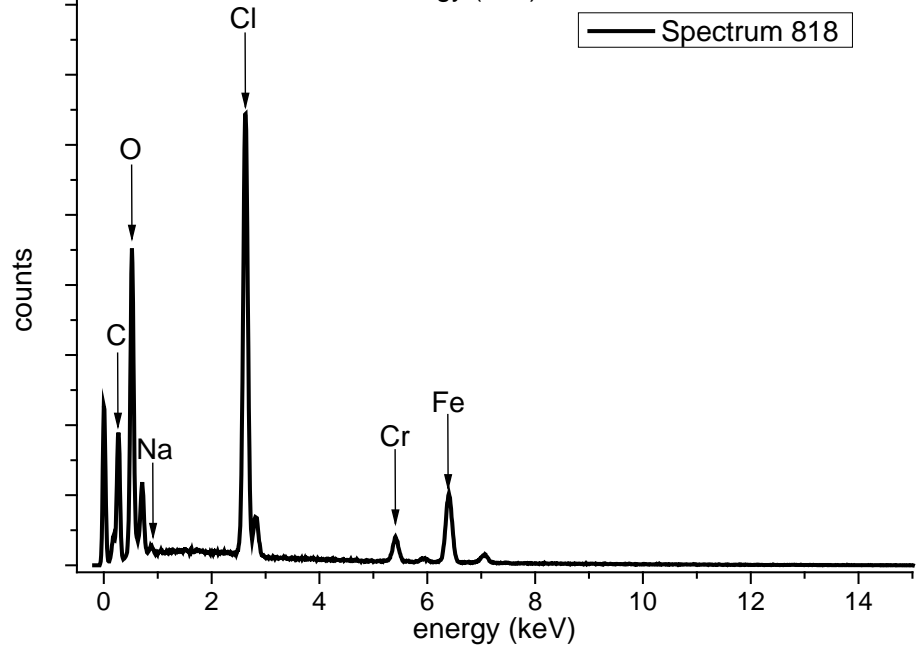
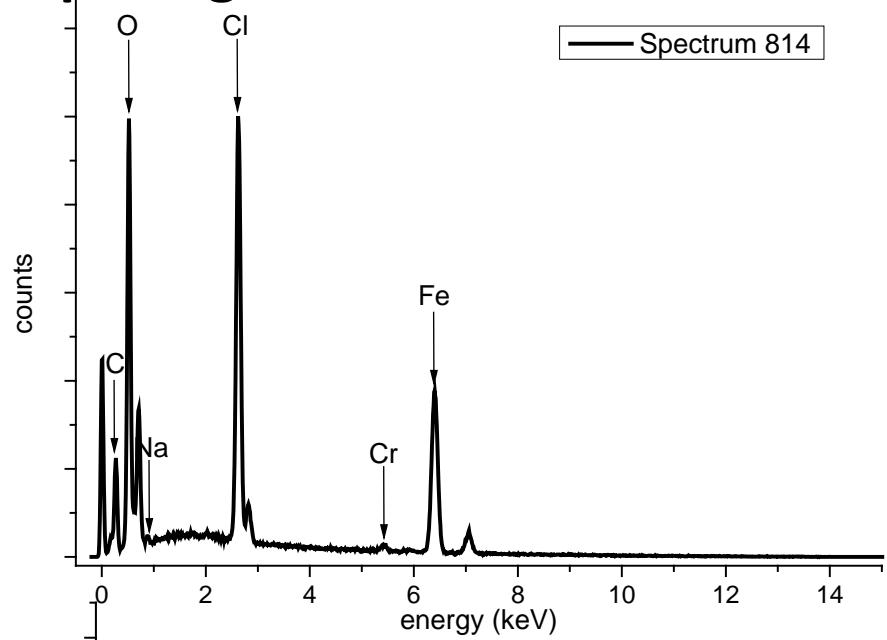
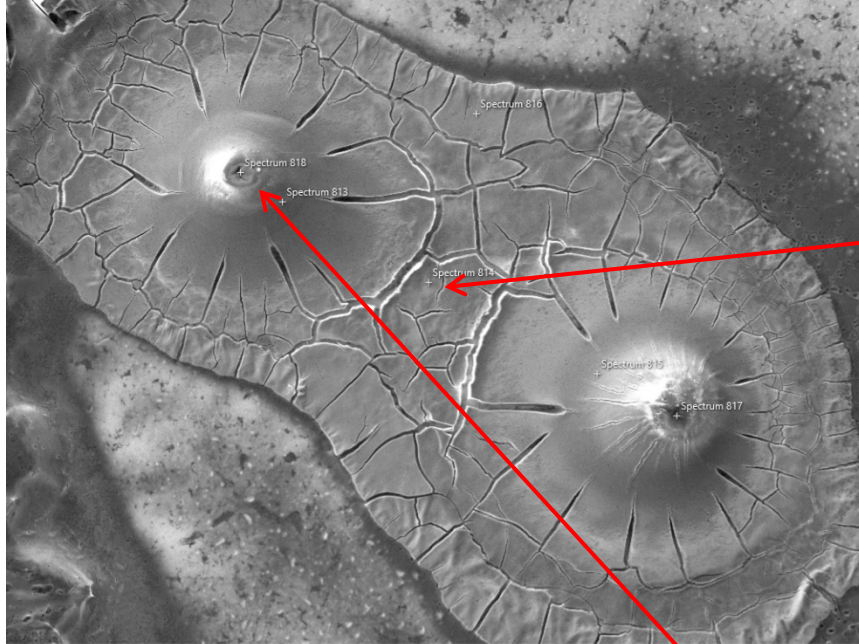
2.5mm

# SEM/EDX Analysis of Biontech - Pfizer Regions comprising Fe and Cr

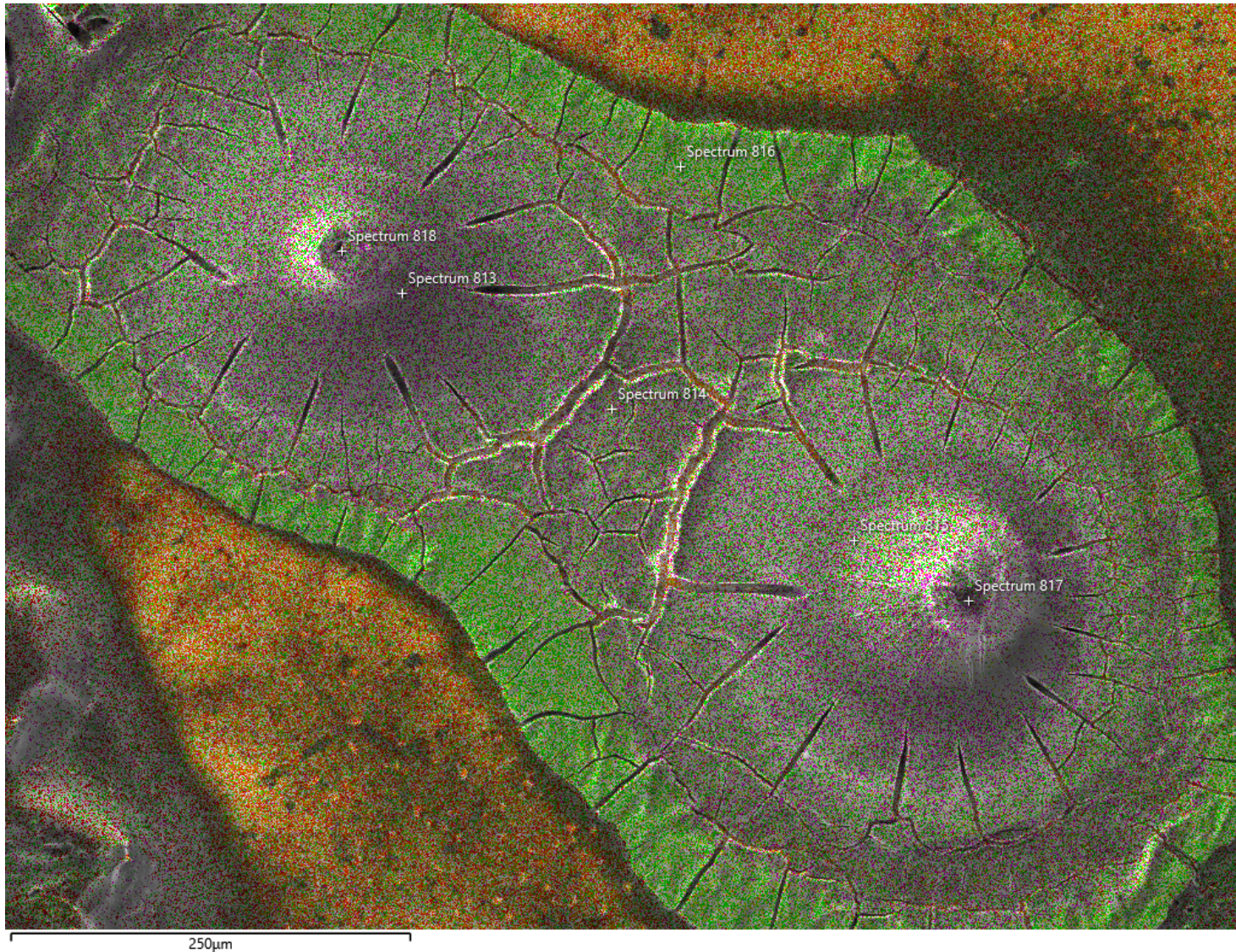


# SEM/EDX Analysis of Biontech - Pfizer

## Regions comprising Fe and Cr

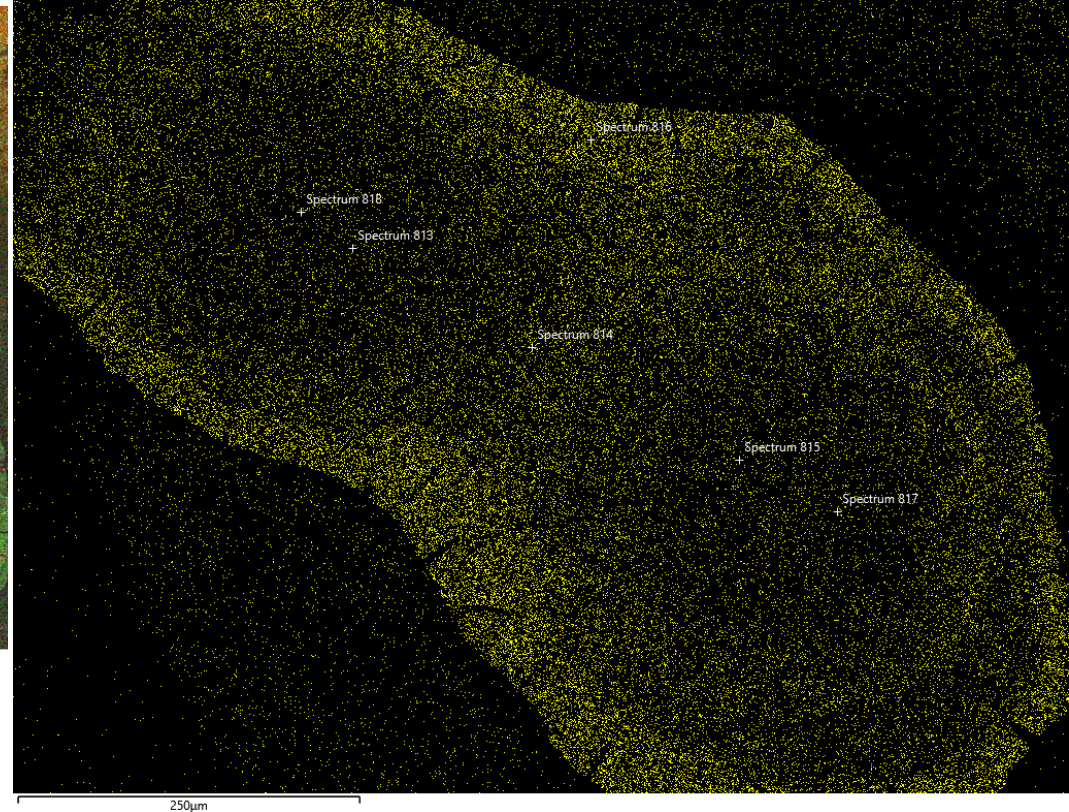
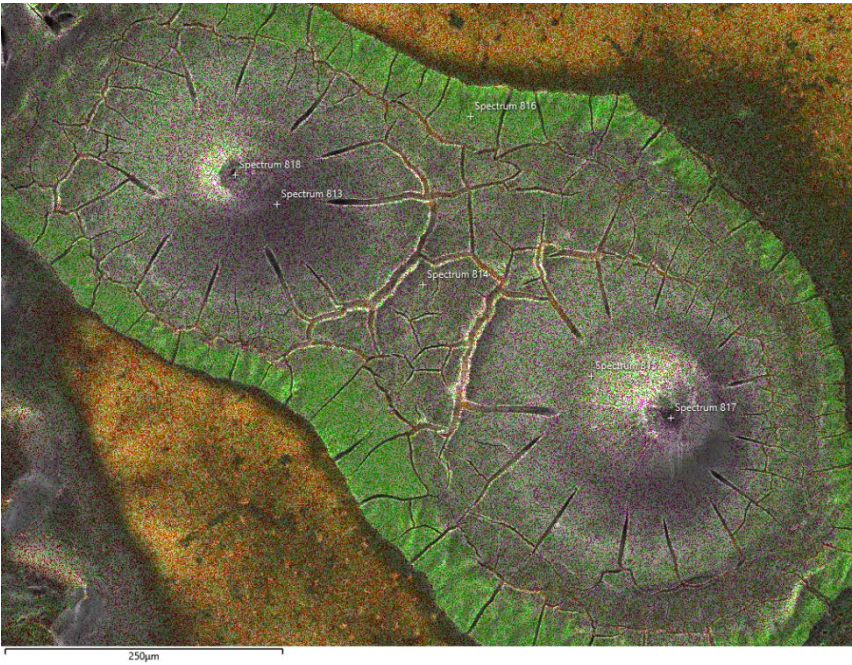


# SEM/EDX Analysis of Biontech - Pfizer Regions comprising Fe and Cr



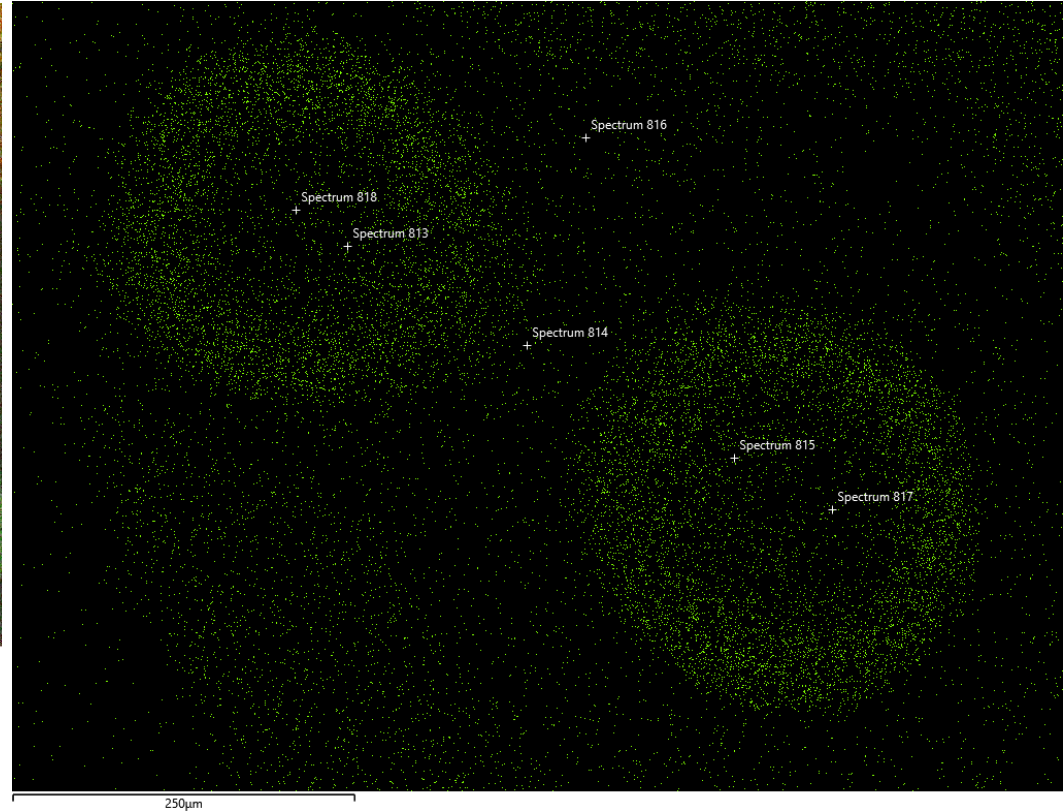
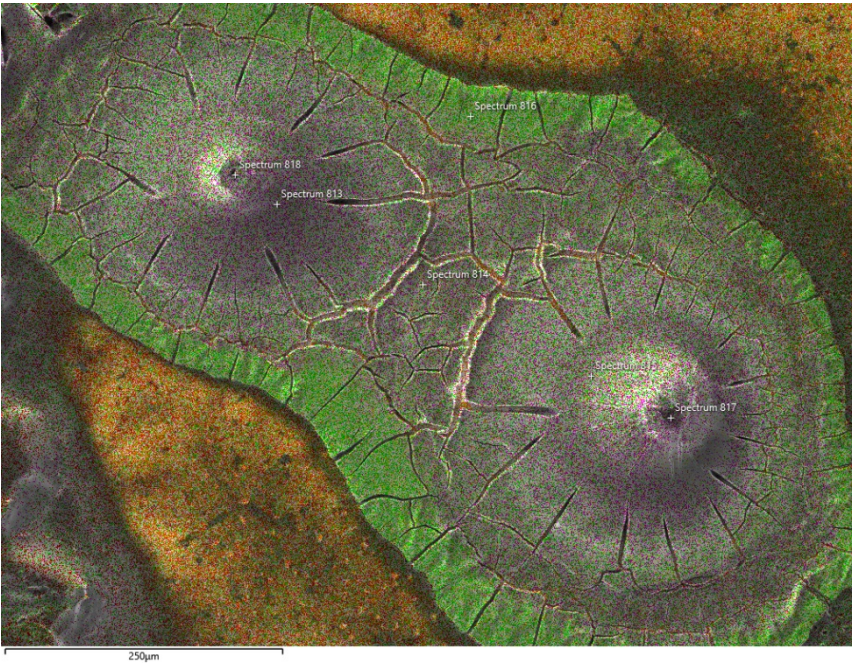
**Layered image: Each color represents a different chemical element**

# SEM/EDX Analysis of Biontech - Pfizer Regions comprising Fe and Cr



**EDX mapping: spatial distribution of Fe**

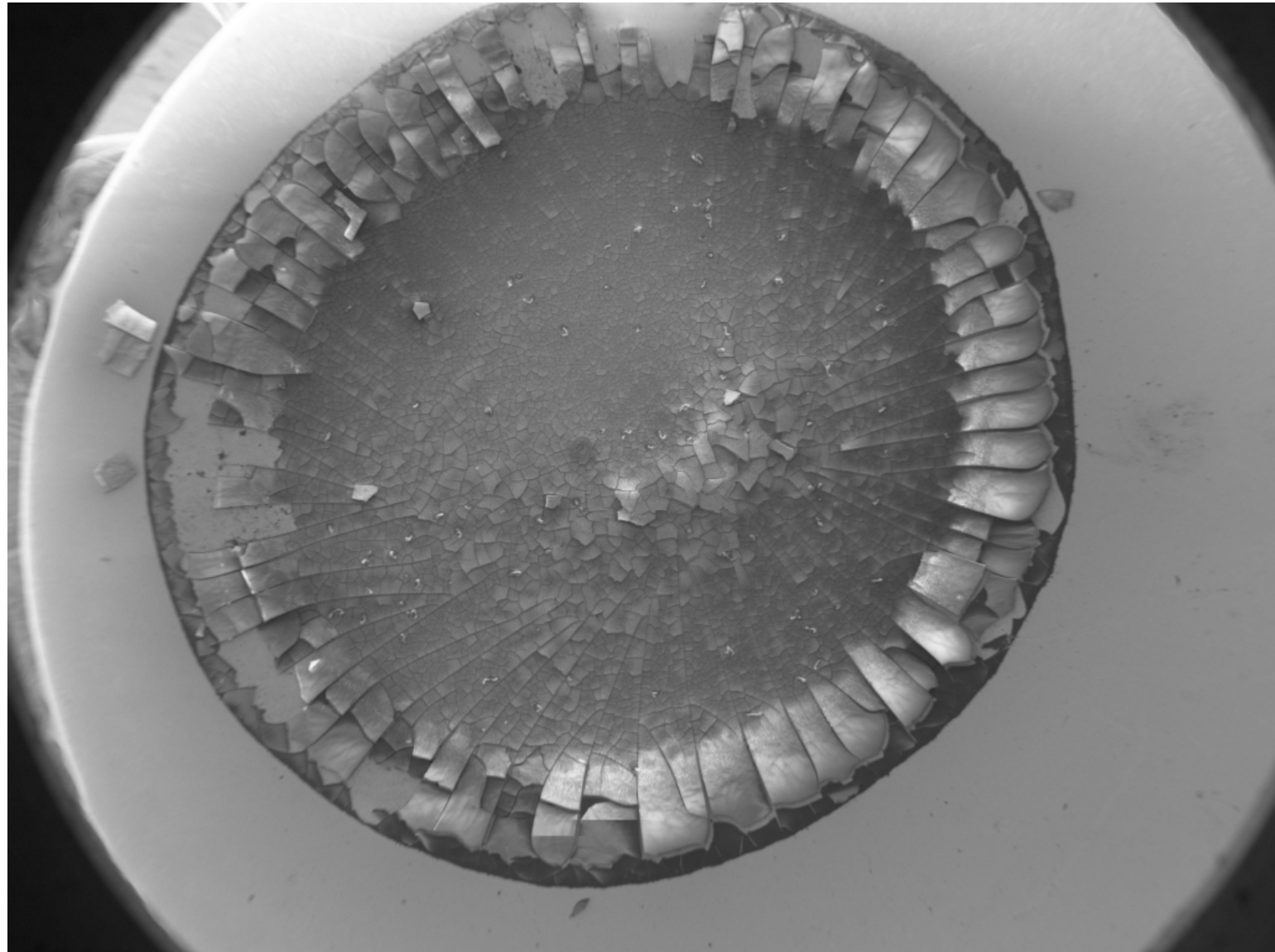
# SEM/EDX Analysis of Biontech - Pfizer Regions comprising Fe and Cr



**EDX mapping: spatial distribution of Cr**

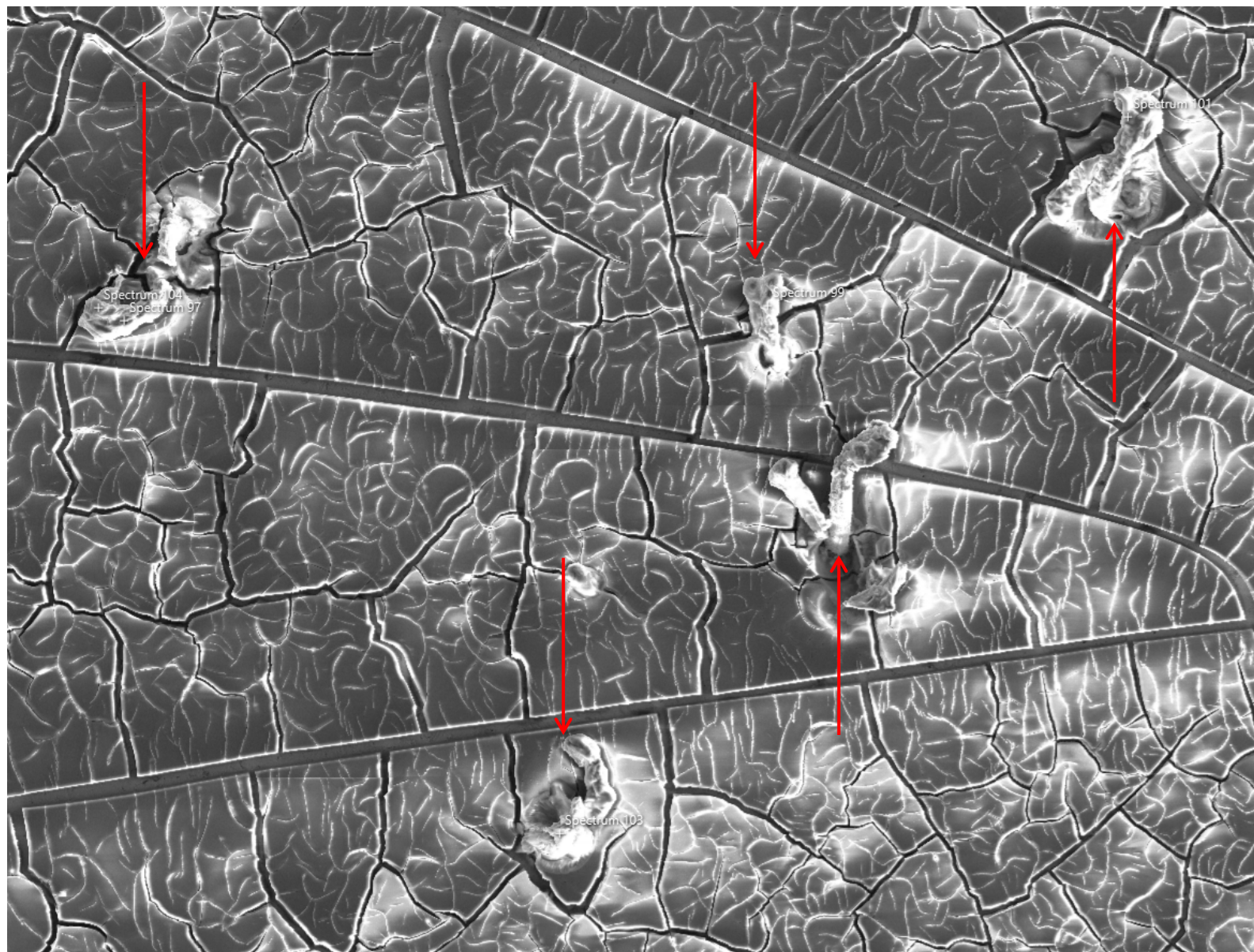


# SEM/EDX Analysis of Johnson & Johnson Overview

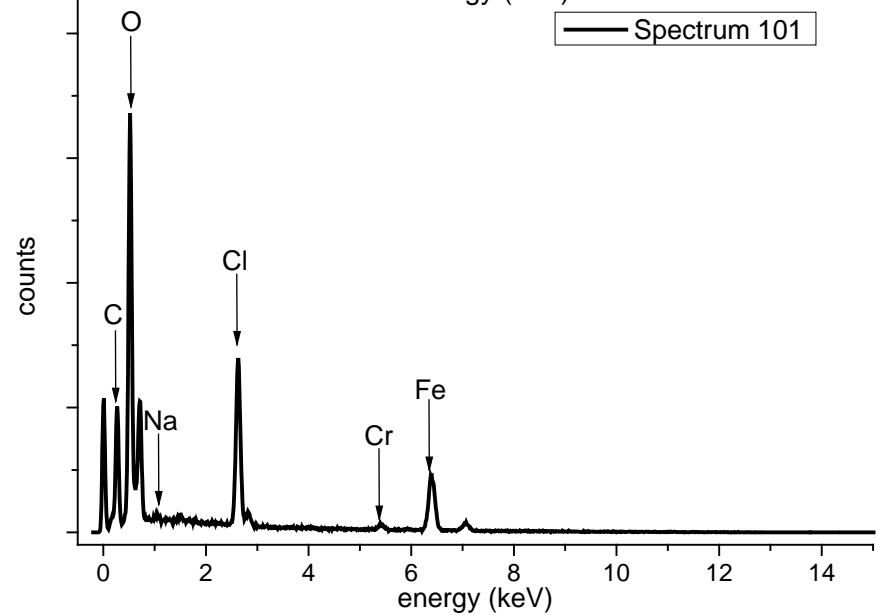
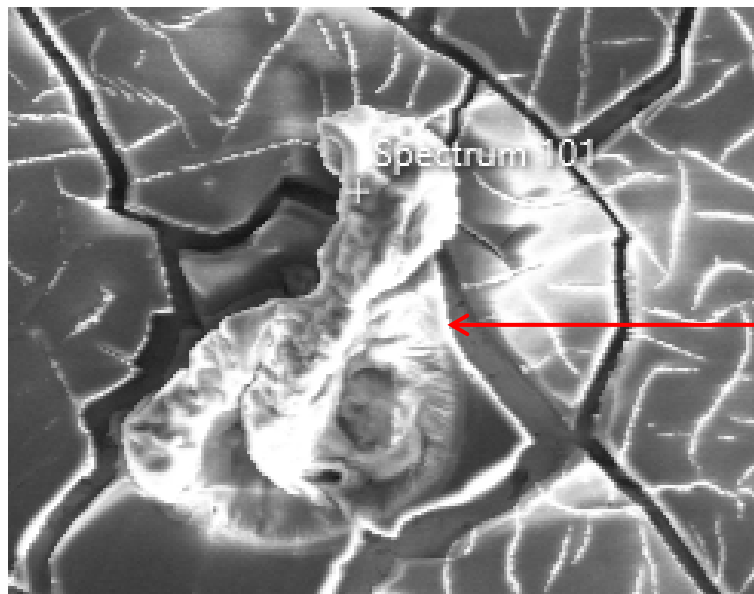
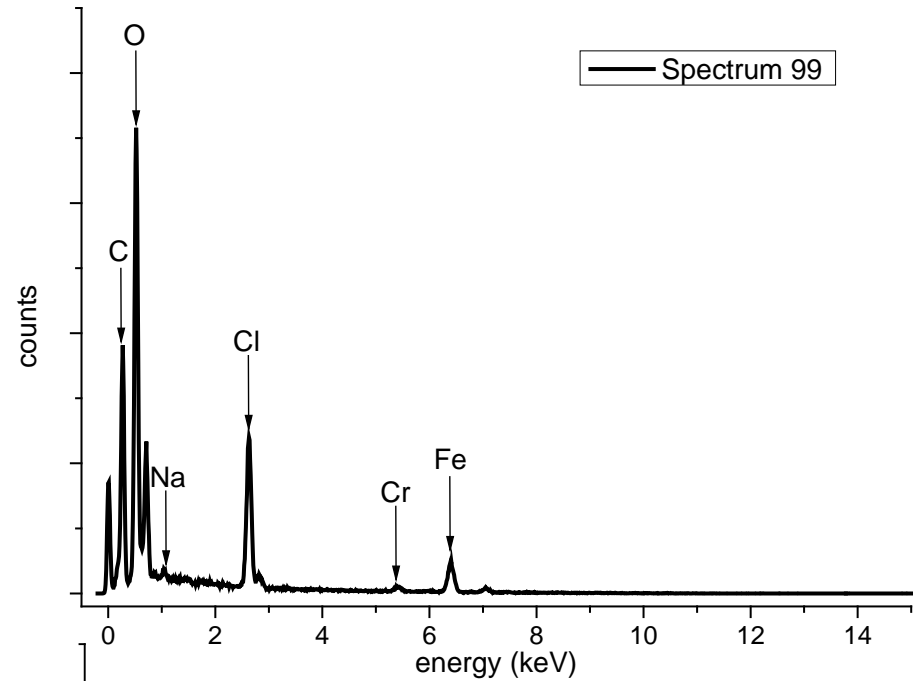
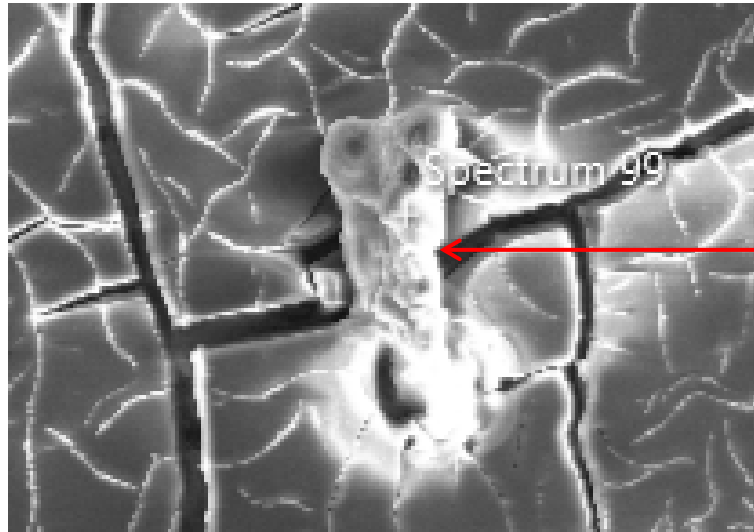


2.5mm

# SEM/EDX Analysis of Johnson & Johnson Regions comprising Fe and Cr

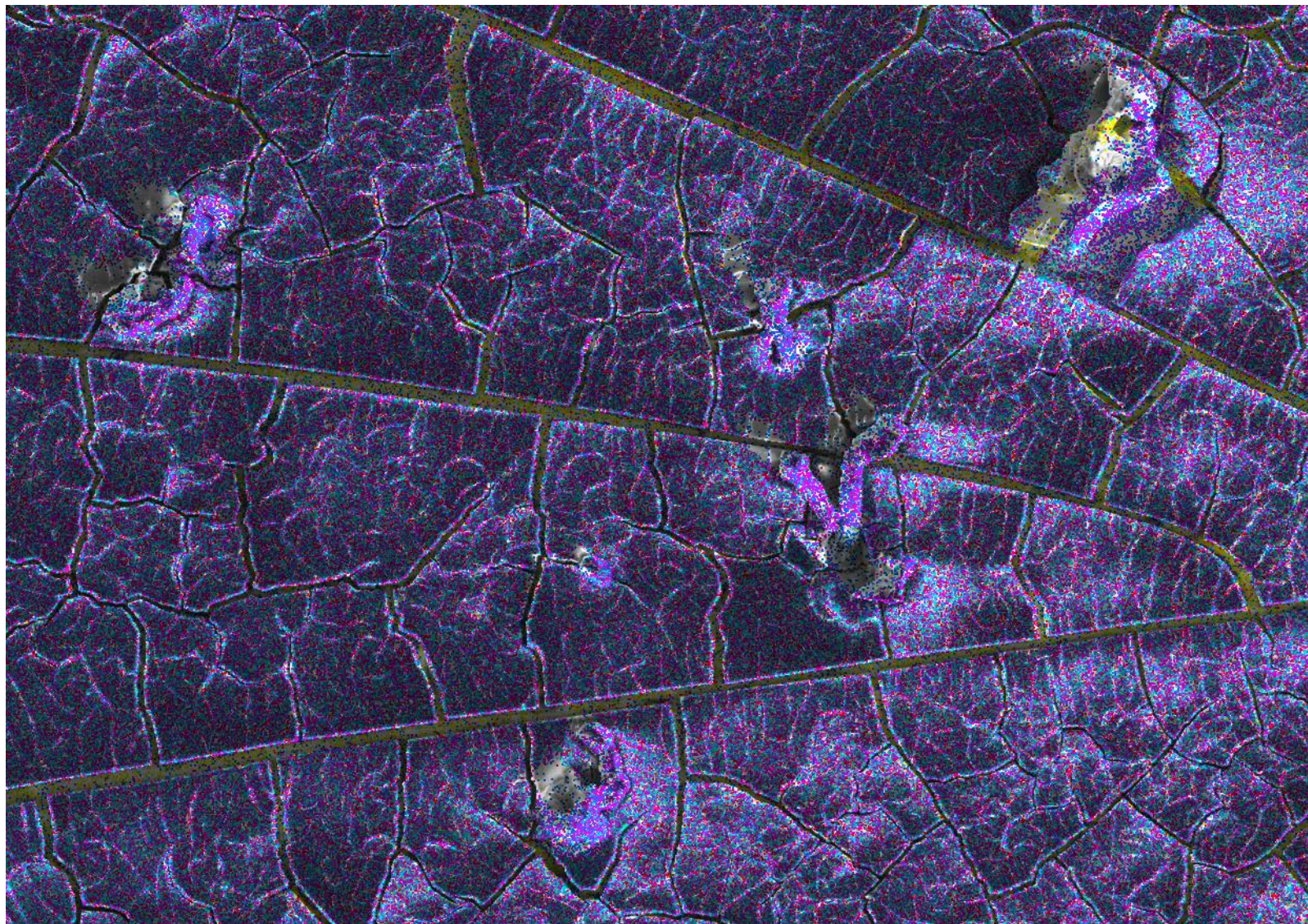


# SEM/EDX Analysis of Johnson & Johnson Regions comprising Fe and Cr



# SEM/EDX Analysis of Johnson & Johnson

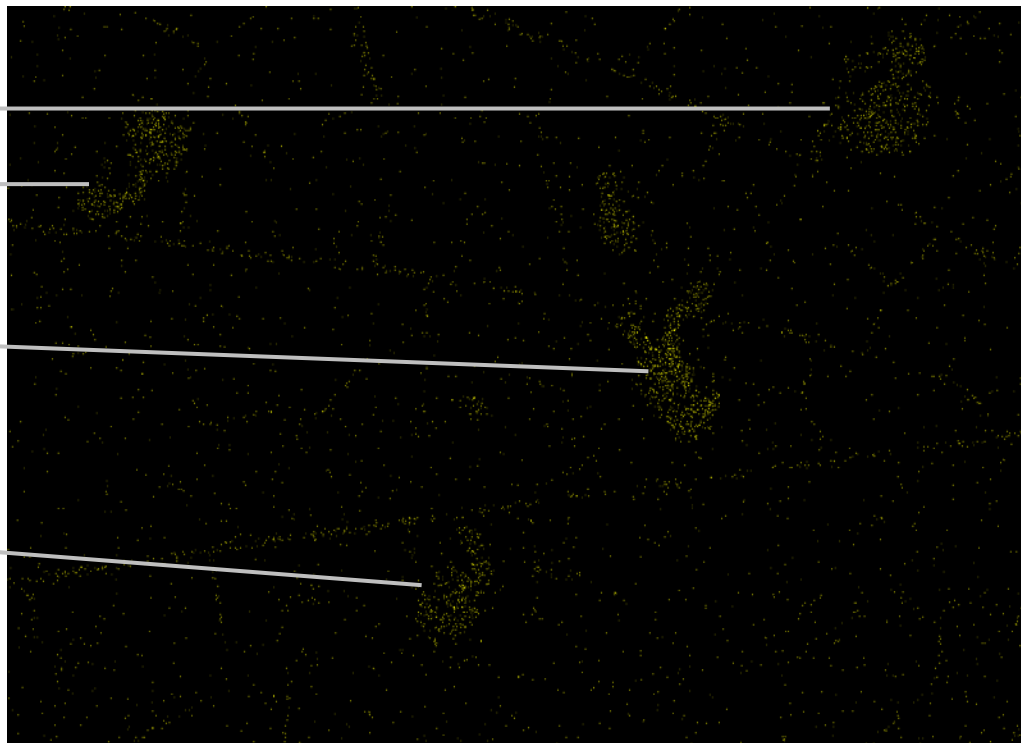
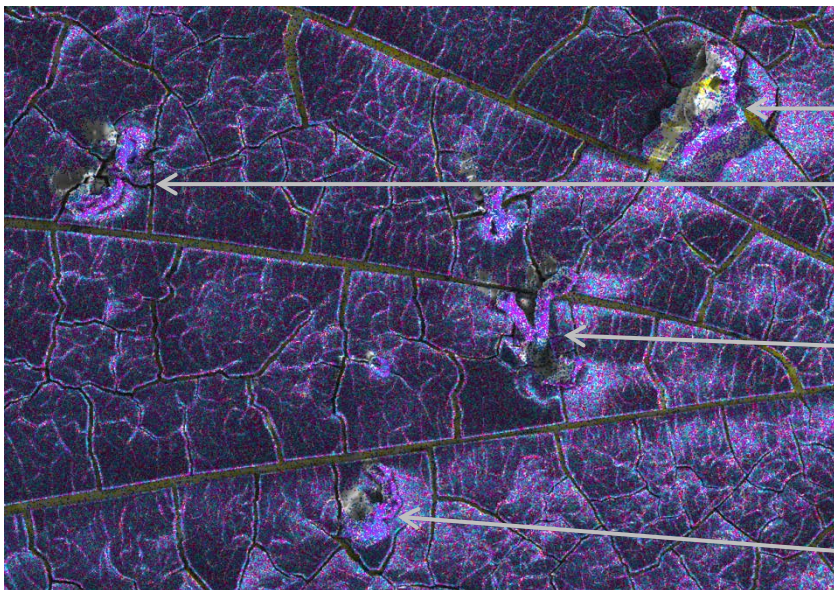
## EDX-mapping of spatial distribution of chemical elements



Layered image: Each color represents a different chemical element

# SEM/EDX Analysis of Johnson & Johnson

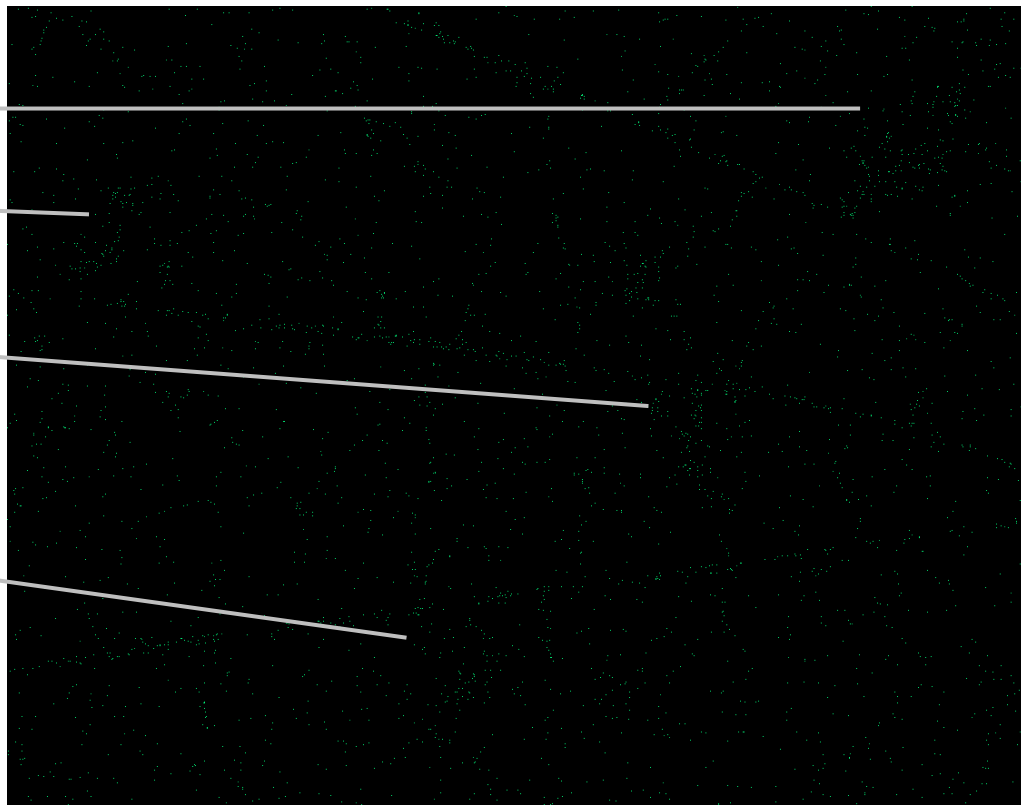
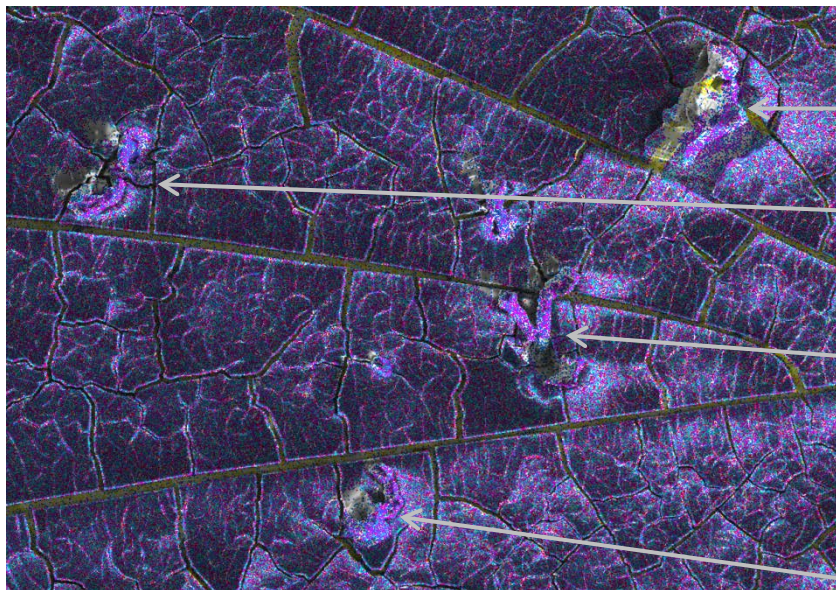
## EDX-mapping of spatial distribution of chemical elements



EDX mapping: spatial distribution of Fe

# SEM/EDX Analysis of Johnson & Johnson

## EDX-mapping of spatial distribution of chemical elements



EDX mapping: spatial distribution of Cr