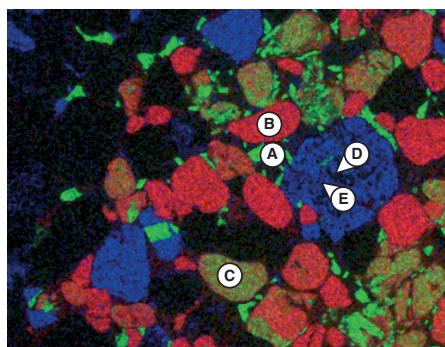


# Combined SEM and Raman spectroscopy: a new analytical tool for geology and mineralogy

## Alluvial deposits from Loch Torridon, Scotland

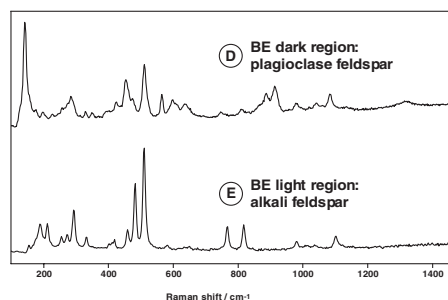
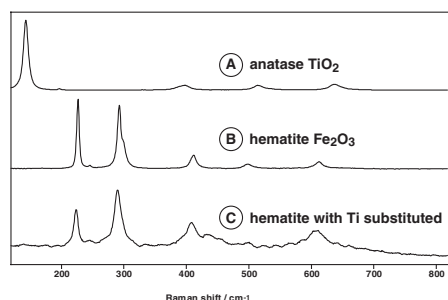
- Spectra from feldspar grain from Torridon with exsolution texture sandstone indicate rapid cooling of parent igneous rock.
- Host mineral and exsolved species can be identified chemically, using Raman spectroscopy, as alkali and plagioclase feldspar.
- Intergrown hematite and anatase, only identified through combined EDX/Raman, helps understand deposition mechanisms and environments.



Fe  
Ti  
K

100 µm

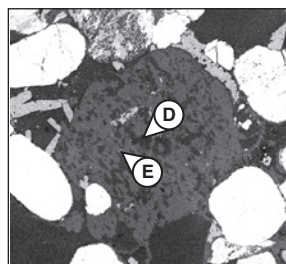
### X-ray analysis



### Raman spectroscopy

## Advantages of combined SEM-Raman in geology:

- Raman allows distinction between polymorphs to be made where EDX cannot - e.g.  $\text{Al}_2\text{SiO}_5$  polymorphs
- Small laser spot size and SEM imaging allow greater spatial resolutions than optical petrography
- Identification of minerals can be performed whilst preserving the textural and spatial contexts - eg, symplectites, intergrowths, overgrowths, exsolution, solid solutions
- Simplifies the characterisation of economic and opaque minerals
- Can use standard petrographic sections allowing re-analysis by optical petrography
- Removes ambiguity of identification by hard-to-teach optical methods such as optical petrography
- EDX analysis complements Raman spectroscopy by revealing information such as subtle variations or the presence of trace rare earth elements



### Back-scattered electron image