

# Microscopy

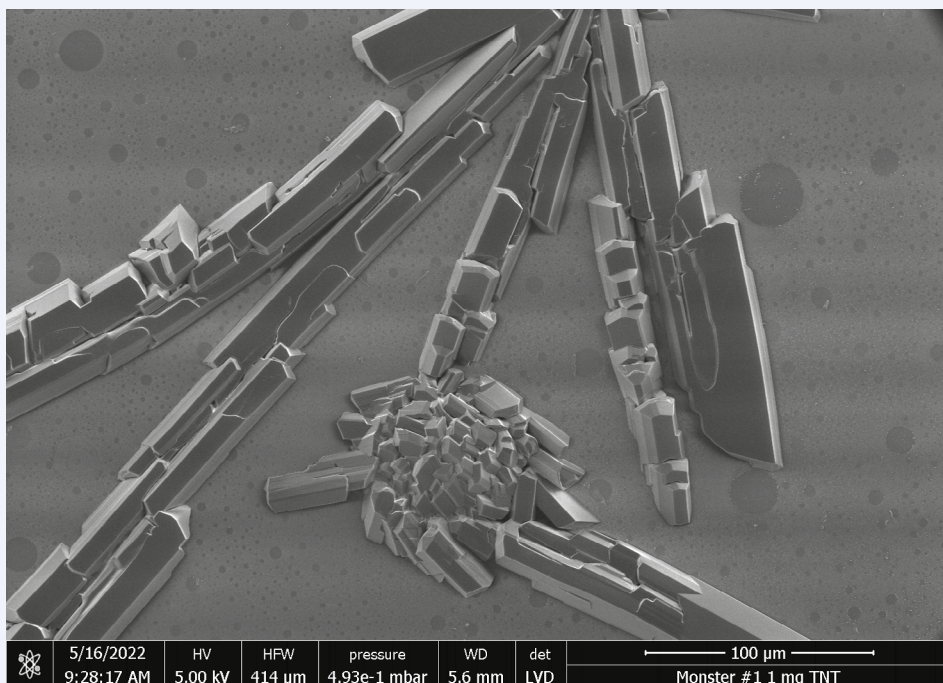
Microscopic characterization can be key to defining your materials. Our various microscopic techniques can generate the required insights to advance your projects.

## Digital Microscopy

The expertise group Energetic Materials is equipped with a modern Olympus DSX-1000 microscope. With this microscope high quality optical images with an amazing focal depth can be produced, thanks to the 3D acquisition method. Next to visualizing your samples it is also possible to do measurements on e.g. grain size, surface roughness or topography. This microscope can magnify samples approximately 5,000×.

## Scanning Electron Microscopy – Energy Dispersive X-ray spectroscopy (SEM-EDX)

If more detail is required, scanning electron microscopy (SEM) could offer a solution. With the SEM, a FEI NovaNanoSEM 650, the samples under ideal circumstances can be magnified more than 200,000× with a limiting resolution of 2 nm.



The SEM images provide information regarding e.g. morphology, relative density, elemental composition and grain size. The NovaNanoSEM 650 is equipped with a low vacuum mode making it also viable for non-conducting samples.

The elemental composition can be determined using emitted X-rays of very small areas. Different items present in a sample can be analyzed separately.

The scanning electron microscope is used for a wide range of innovative projects, like the analysis of the emission products of smoke grenades. The components of the smoke are captured either on a filter or on a sticky carbon material and analyzed by SEM.

The SEM is also used for comparing different production methods of energetic materials. After synthesis of the energetic materials, products are analyzed by SEM based on their grain size, morphology and homogeneity.

On a regular basis the microscopy experts contribute to challenges from other disciplines. For example the corrosion of reinforced concrete of the Afsluitdijk, the contamination during the production process of semi-conductors or which defects can be found on delicate mirrors in use in the space industry.

If you see a potential application in one of your projects please feel free to contact us using the contact details below.

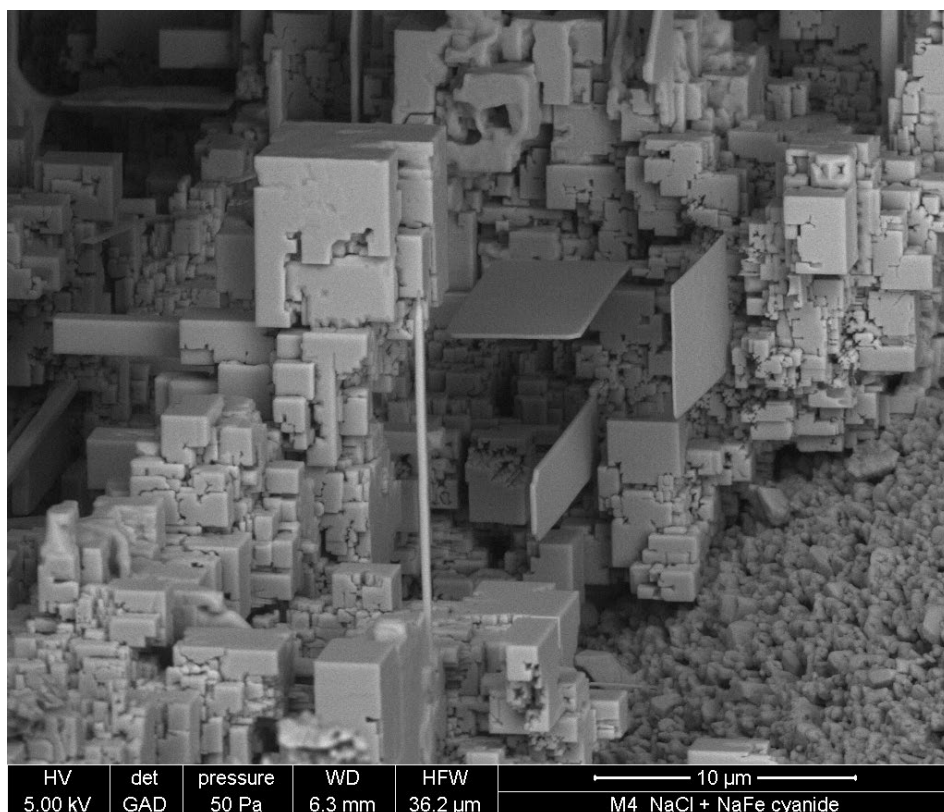
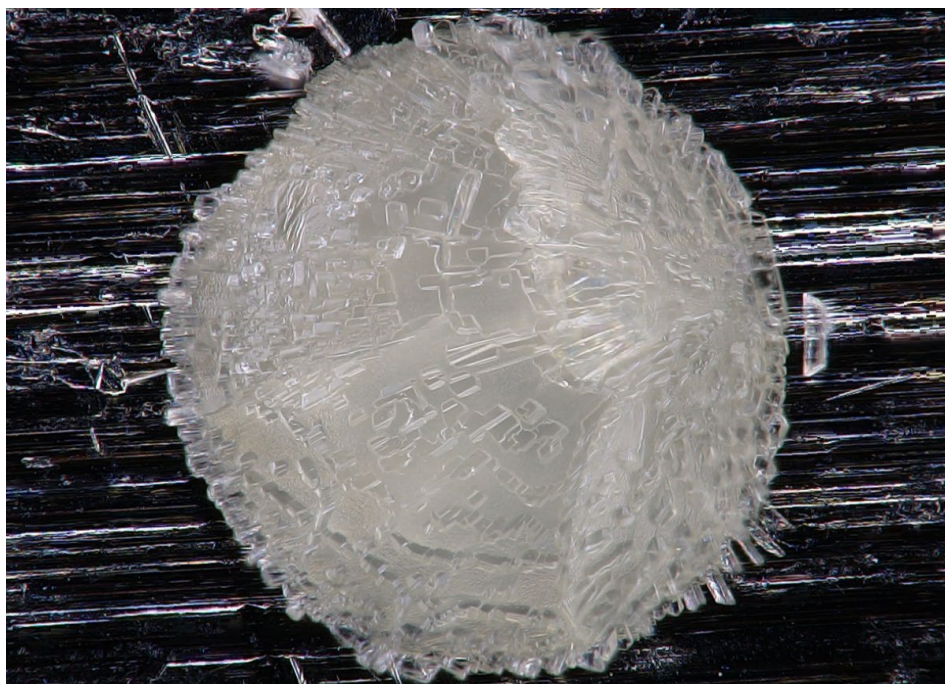
#### Microscopic techniques

Olympus DSX-1000 digital microscope

- Great image quality with high focal depth
- Roughness analysis
- Surface topography
- Grain size analysis

#### NovaNanoSEM 650 Electron microscope

- Wide range of detectors including STEM
- Chemical analysis by EDX
- Low vacuum mode for non-conductive materials



**TNO Energetic Materials**

Defence, safety and security

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