

Boron substrates for SEM/EDX micro analysis

What are boron substrates and which are their advantages?

A considerable number of natural and artificial materials are made of light elements like carbon (e.g. soot), nitrogen (e.g. nitrates) and oxygen (e.g. minerals).

Advances in EDX (energy dispersive x-ray spectroscopy) technology enable nowadays the measurement and semi-quantitative determination of light elements in micro- and nano-materials by using scanning electron microscopy (SEM).

So far, carbon pads and polycarbonate filters were generally used as substrates or sampling surfaces for subsequent SEM/EDX analysis. The disadvantage of these carbon bearing substrates is that the carbon (C) concentration cannot be determined for particles smaller than 2 μm in diameter or for materials built of thin structures. The reason why this limitation is present lies in the fact that the measured carbon is not only coming from the analyzed substance but from the substrate itself.

This signifies certainly a large disadvantage when analyzing C-bearing materials both in environmental studies and in other disciplines like material sciences.

Particle Vision GmbH has closed this gap with the development and serial production of boron substrates (Figures 1, 2). With the combination of boron substrates and a state-of-the-art, high-resolution and highly sensitive

EDS system it is from now on possible to analyze carbon and other light elements semi-quantitatively. This progress applies for both manual and fully automated SEM/EDX analysis.

The boron substrates can be exposed in passive samplers as the Sigma-2 (VDI2119: Page 4) in case that a quantitative sampling and calculation of mass concentrations of Particulate Matter (PM) in the atmosphere is required.

For the characterization of carbon-bearing materials, the samples can be easily prepared or transferred on the boron surface in the lab.

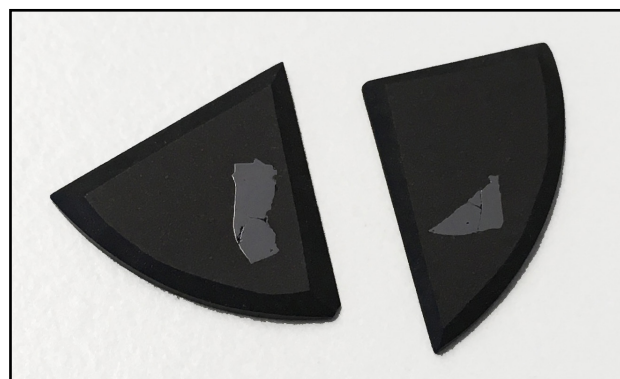


Fig. 1: Boron substrate consisting of a polished boron crystal embedded in an electrically conductive synthetic material.

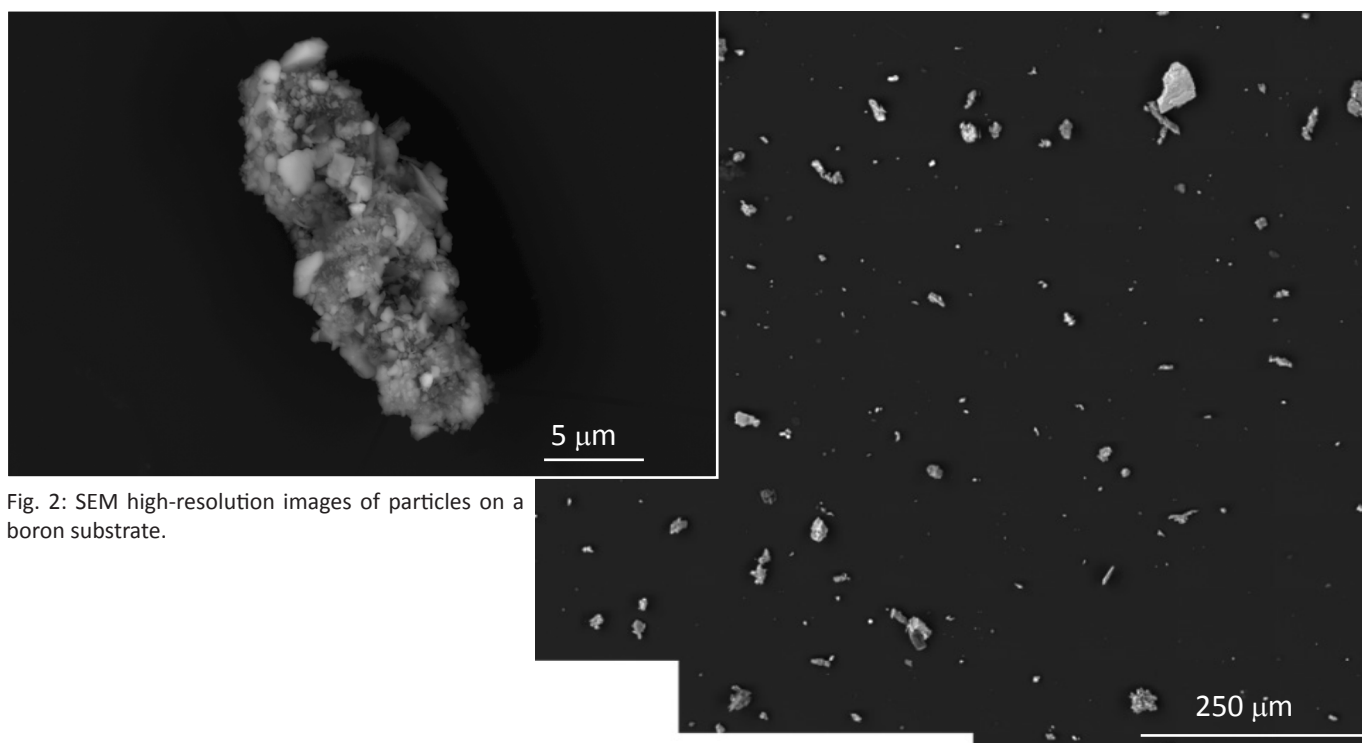


Fig. 2: SEM high-resolution images of particles on a boron substrate.

Technical specifications

Chemical composition	99.7% boron
Manufacture	One or several polished boron crystals embedded in an electrically conductive synthetic material. (¼ rondel, r = 15 mm, thickness = 1-2 mm)
Analyzable boron surface	Minimum 2 mm ² Very flat, smooth and homogenous surface
Reutilization	Boron substrates can be cleaned and reused several times
Additional information	Boron crystals can be porous. Hence, some surfaces can contain few holes Boron is an extremely hard and brittle material. Therefore, it is possible that few fractures formed on the surface while producing the substrates
Adhesive layer	Boron substrates can be delivered with (for better adhesion of the sample) or without an adhesive coating. Particle Vision can renew the adhesive layer on recycled substrates, if desired.
