

Opportunities offered by scanning electron microscopy for the analysis of materials obtained by innovative processes

Scanning electron microscope (SEM) is a key tool used for the characterization of materials particularly in the case of innovative processes that can present a new metallurgical panorama compared to the standard production techniques. These technologies, in fact, can induce peculiar microstructure due to the heat gradients and high cooling rates. Two examples of the versatile character of the scanning electron microscope are presented.

In order to perform a multi-level analysis on a non-weldable grade of nickel superalloys processed by Laser Powder Bed Fusion (LPBF), observations were carried out at the microstructural level with a Field Emission Scanning Electron Microscope (FE-SEM) equipped by EBSD and EDS detector, for the reconstruction of crystallographic and elemental maps. These analyses have been used to identify the main failure mechanisms of the investigated material.

A second example relates to the microstructure of alumina components produced by Binder jetting (BJ) 3D printing. The analyses were focused on the particle sintering after different process step, investigating the development of ligaments between them, in an attempt to acquire more precise information about the sintering process.

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