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Editorial

Preface to the special issue on advanced microstructural characterization of materials

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Microstructural characterization is a vital part in materials science, as it plays a key role in understanding the structure-property relationship in materials. Various advanced microstructural characterization techniques have emerged, for example, scanning electron microscopy, transmission electron microscopy, scanning transmission electron microscopy, high resolution (scanning) transmission electron microscopy, electron backscatter diffraction, energy dispersive x-ray spectroscopy, electron energy loss spectroscopy, precession electron diffraction, energy-filtered transmission electron microscopy, and atom probe tomography. The applications of these techniques have greatly advanced the understanding of material microstructures on different scales from micrometer to atomic scale. Advanced microstructural characterization can be applied to a variety of materials such as metals, alloys, ceramics, polymers and composites.

Papers published in this special issue involve different advanced microstructural characterization techniques, including scanning electron microscopy, transmission electron microscopy, high resolution transmission electron microscopy, energy dispersive x-ray spectroscopy, and focused ion beam tomography (or serial sectioning). Materials types include metals, alloys, metallic glasses and ceramics. In all these papers, advanced microstructural characterization was used to achieve good understanding of the material microstructures, which were correlated to processing and properties of the materials. Eventually, an understanding of the processing-microstructure-property relationship was achieved in different materials. The essence of materials science is to understand this relationship. These papers demonstrate the vital role that advanced microstructural characterization plays in materials science.