Call for Papers
IEEE Signal Processing Society
IEEE SIGNAL PROCESSING MAGAZINE

Special Issue on Signal Processing for Advanced Materials

The development of new materials has been a hallmark of technological advancement since at least the Bronze Age, when copper and tin were alloyed to create tools that had properties favorable to those made from stone. For thousands of years, until the development of microscope imaging, new materials continued to be developed "blindly," without any understanding of the effects of the structure at the micro- or nanoscale on the observable properties of a material. With the advent of sensing modalities such as electron microscopy and x-ray tomography, huge amounts of microstructural data of many different classes of materials have become available. However, the materials science field has only recently begun to explore the methods of modern data and imaging science provided by the field of signal processing. Where such methods have been applied, substantial leaps forward have been made in the design and development of advanced materials. There is a tremendous opportunity for further interdisciplinary work between the signal processing and materials science fields. This special issue aims to highlight both progress that has already been made and research areas where signal processing methods could revolutionize the field of materials development in the future.

To this end, this call seeks papers describing recent advances in the application of signal processing methods to materials characterization, as well as papers on current unsolved materials research problems for which signal processing expertise is needed. Some examples of topics include improved methods for sensing and reconstructing data at scales on the order of microns, nanometers, or even the atomic scale; analysis of materials image data, for the purposes of denoising, deblurring, segmentation, and feature extraction, for example; statistical modeling of microstructure of materials; and stochastic simulation of materials.

Topics of interest include (but are not limited to):

- Emerging sensor modalities for characterization
- Tomographic reconstruction of materials images
- Physics-based forward modeling and regularization
- Non-intrusive methods for regularization
- Feature-based reconstruction for materials datasets
- Density estimation on data manifolds
- Phase retrieval
- Data fusion for materials datasets
- Uncertainty quantification
- Dynamic sampling for characterization
- Image denoising, deblurring, segmentation
- AI methods for modeling of materials
- Stochastic simulation of materials structures
- Statistically rare materials phenomena
- Topology of materials
- Model fusion
- Superresolution
- Graphical methods for microstructures

White papers are required, and full articles are invited based on the review of white papers. Articles submitted must be of a tutorial and overview/survey nature and in accessible style to a broad audience. Submissions will be reviewed according to the IEEE Signal Processing Magazine guidelines, and should not have been published or under review elsewhere. Submissions should be made online at http://mc.manuscriptcentral.com/sps-ieee. For guidelines and information on paper submissions, visit http://www.signalprocessingsociety.org/publications/periodicals/spm/.

Important Dates

White papers (4 pages) due	December 05, 2020	Revised manuscripts due	July 01, 2021
Invitation notification	January 15, 2021	Final decision notification	September 01, 2021
Full-length manuscripts due	March 05, 2021	Final manuscripts due	October 5, 2021
First reviews to authors	July 05, 2021	Publication date	January 2022

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