

Preface

Special Issue on Advanced Sensing Systems and Multifunctional Materials

Sensors are critical technological systems for practically any engineering field of study. Ubiquitous sensor arrays and systems have been the research agenda to guarantee the future of global economy ranging from national security, environmental health, personal health care, structural resiliency, climate change, and etc. Many of the commercially available sensors are robust, stable, and, in general, high performance. However, sensors are not usually tailored for a specific intended application. The result is that conventional sensors can be adopted and used but with sub-optimal results. A notable example is the case of wireless sensors and sensor networks for structural health monitoring. While commercial wireless platforms exist, their power requirements, communication protocols, and/or sensing resolution may be insufficient for detecting damage in large civil infrastructures and over long timeframes. The lack of an optimized system has motivated the development of numerous academic prototype systems specially designed for the structure to be monitored.

In fact, recent advances in micro-fabrication, low-cost prototyping, and nanotechnology have permitted the design of sensors based on different chemical, physical, and/or electrical mechanism of operation. Smart sensors and smart materials can be engineered for detecting physical damage in civil structures, monitoring environmental air quality, or capturing cells for biomedical purposes, to name a few. It is only sensible to derive a sensing solution for a specific application, since the engineering constraints can vary case by case.

The aim of this special issue, titled *Advanced Sensing Systems and Multifunctional Materials*, is to showcase the breadth of cutting edge and novel research in the area of sensor development. The goal of this issue is not to highlight one class of sensors, but instead, to illustrate the wide variety of sensor prototypes, fabrication methods, and modes of operation. The five articles in this issue feature sensors fabricated using nanotechnology and micro-fabrication techniques, and their principles of operation range from optics to chemisorption to piezoelectricity. Motivation of this special issue can be traced back to the *2011 First International Conference on Smart Structures and Systems (ICOSSS'11)*, which was part of the *2011 World Congress on Advances in Structural Engineering and Mechanics (ASEM'11 Plus)* held in Seoul, South Korea. Selected presenters at this international conference (working in areas like multifunctional materials, smart sensing systems, and new sensor concepts) were invited to contribute to this special issue.

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Sincerely,

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