

# **Material Process Monitoring and Structural Health Monitoring for Reliable Materials and Structures**

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Some activities are concentrated on the mechanical reliability to keep integrity of advanced materials and devices. Structural health monitoring techniques and non-destructive evaluation methods are developed to evaluate the process monitoring of material fabrication and the degradation due to fatigue or corrosion. Acoustic emission (AE) method is one of the in-situ nondestructive evaluation methods and may be adapted to the detection and evaluation of material processing. Especially AE inverse analysis is promising method to understand the damage or impact during material processing. Newly developed system can continuously record the signals from sensors during a whole experimental time. This method was applied to several types of material processes such as thermal spray, shot peening, laser peening, welding and so on. The other provides the advanced security system for the operation and maintenance of industrial facilities based on wireless sensor network. This is achieved with new sensors for the structural damage detection, energy harvesting and wireless communications. In the presentation, we will introduce new sensors for fatigue and corrosion, and wireless network. The fatigue sensor is smart stress-memory patch which can estimate the number of loading cycles and stress amplitude using crack growth properties in thin metal sheets. Additionally, wireless corrosion monitoring system was constructed by the use of ACM (Atmospheric Corrosion Monitor) type corrosion sensor. Finally, wireless sensor network was configured to communicate the multiple sensors. These proposed systems have a great potential for the safety of industrial structures.