Acoustic emission (AE) testing for structural health monitoring (SHM) of structures and infrastructures.

In the last few decades, several nondestructive testing (NDT) techniques have been developed for structural health monitoring of structures and infrastructures. Acoustic emission (AE) testing is among the most advanced NDT techniques. This is based on the genuine generation and propagation of bulk waves within structures, due to localized energy releases associated with response/damage and degradation processes. The technique is passive since the genuinely generated acoustic activity can be passively detected and analyzed/processed to locate and characterize the mechanical sources. AE signals can be detected time continuously, and the monitoring assessment can be implemented remotely in real time.

The copious literature and technical applications demonstrated that the technique can be efficient for detecting, characterizing, and localizing various damage and degradation phenomena and patterns within diverse materials and structural systems. The application of AE testing for service monitoring of structures and infrastructures is spreading, especially for critical structures such as suspended bridges. However, technical and operative issues still affect both AE testing and damage analysis. For example, the background noise and the chaotic nature of the acoustic phenomena often make data interpretation challenging.

The seminar will briefly summarize the basics of AE testing and data analysis, discussing the latest applications, with regard to several different materials, structures, and case studies. Both laboratory and field applications will be addressed, considering material-, element-, and system-based tests. Particular focus will be on the well-consolidated data analysis techniques, as well as the latest literature advances will also be illustrated. The seminar will provide the basic information and tools to understand the issue in terms of scientific, technical, and operative aspects, possibly stimulating the interest of the participants towards further studies in the field.

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3. **D'Angela D**, Ercolino M, Bellini C, Di Cocco V, Iacoviello F. Characterisation of the damaging micromechanisms in a pearlitic ductile cast iron and damage assessment by acoustic emission testing. Fatigue & Fracture of Engineering Materials & Structures 2020; 43(5): 1038–1050. DOI: 10.1111/ffe.13214.

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