

AE method in the IoT and AI era for its application to material engineering

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AE method is a technique that can detect the generation of damage in materials and structures online, and is a useful technique for evaluating their soundness. The advantage of this method is that a wide area can be monitored by a single sensor, and it is an indispensable technology for structural health monitoring. With the dramatic development of the Internet communication environment in recent years, continuous remote monitoring of AE data around the world has become easier. We have developed the continuous streaming technique for AE waveform in order to in-situ monitor material process such as welding, thermal spray, friction stir welding and so on. Wireless measurement based on IoT is also a powerful tool for material process monitoring by AE. The development of the field of “data science” changes also dramatically the method to treat data in any types, and it can be applied to analyze AE signals consist of huge data with continuous high frequency spectrum. Several noble methods can be used to analyze AE data based on recent “data science” technology. For example, AE time-series data can be analyzed by Markov Chain Monte Carlo (MCMC) method which enables to select the suitable models for AE data and estimate the parameters of models. Some examples for various materials will be demonstrated.