# An acoustic emission approach for identifying adhesive and cohesive fracture modes in adhesively bonded joints subjected to mode I fatigue loading

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The research aims to verify the feasibility of Acoustic Emission (AE) as a reliable technique for identifying adhesive or cohesive fracture modes in adhesively bonded joints subjected to mode I fatigue loading. A mode I fatigue crack monitoring approach based on AE was applied to double-cantilever beam (DCB) specimens tested in the lab. Two AE sensors continuously monitored specimens manufactured bonding together metal substrates by two different bi-component epoxy adhesives (3M 7260 and 3M 9323) during mode I fatigue tests. Such tests were periodically interrupted to apply 2D Digital Image Correlation (2D DIC) and visual inspection, by a camera, in order to gather information about the position of the crack front within the adhesive and validate the AE outputs. Artificial intelligence pattern recognition methods (specifically, Self-Organized Maps and k-means) were implemented to cluster AE waveforms recorded during fatigue tests. The clustering was based on AE main features such as amplitude, energy, duration, counts and variance. Once the waveforms were clustered, it was possible to separate the waveforms related to fatigue damage from those related to background noise. After that, further analysis, considering just the waveforms associated with the fatigue damage, was performed to identify adhesive or cohesive fracture modes happened into the fatigue tested specimens.