

ACOUSTIC EMISSION SENSOR FOR DIRECT TRACING OF DAMAGE IN HISTORIC OBJECTS

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There is a general awareness that environmental fluctuations are at the origin of most of damage to works of art such as irreversible deformation, fracture, disintegration or delamination. Repeated cycles of stress lead to the fatigue of materials due to the accumulation of even small physical changes at the micro level.

To assess the environment-induced damage to the objects, detailed knowledge on the cause-effect relationships between the hazards and the damage is required. Therefore, variations of temperature and relative humidity, dimensional response of objects, mechanical shocks or vibrations are usually measured. However, relationships between the measured hazards and damage are difficult to establish as historic objects are built of a variety of materials having different responses to external deterioration factors.

This study has established the usefulness of acoustic emission (AE) technique in direct tracing the evolution of damage in works of art caused by their exposition to the environmental impacts. Monitoring of the AE due to crack propagation, yielding, fatigue, creep, fibre fracture, delamination, corrosion or stress corrosion was found to be an important non-destructive tool capable of tracing mechanical damage in materials accurately in space and time. The research carried out within the EC funded 'SensOrgan' project has resulted in the development and commercialisation of a simple, robust and economic AE sensor to help conservation specialists in identifying hazards well before any visual damage appears.