

## ELECTRONIC SPECKLE PATTERN INTERFEROMETRY (ESPI) IN ANALYSIS OF THE CLIMATE-INDUCED DAMAGE OF PAINTED WOOD SURFACES

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Electronic Speckle Pattern Interferometry (ESPI) is an effective tool for the detection of sub-micrometer surface movements to indicate and localize material defects. This method is used to map the formation and development of damage to decorative layers on wood induced by variations in relative humidity (RH) in its environment. Specimens of wood coated with gesso and paint imitating the historic objects are subjected first to real RH fluctuations in a climatic chamber, then to cycles of mechanically produced dimensional changes simulating the responses to climatic fluctuations. The interference patterns recorded before and after deformation of the specimens yield a characteristic fringe pattern containing full required information. The measurement of the absolute phase and absolute deformation is possible by the implementation of the phase shifting technique. The goal of the investigations is to identify the critical RH levels dangerous for the polychrome wood as a function of the amplitude, duration and starting level of the RH change and number of such changes. The ESPI method was found to trace precisely cracks and delamination of the paint layer. Sound-induced vibration of the surface proved very effective in characterizing the extent and mechanical properties of the delaminations.

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