Multiscale Technique for Localized Strain Investigation in Metal Alloys and Carbon Fiber Reinforced Composites Based on Data of Strain Gauging, Digital Image Correlation and Acoustic Emission

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Abstract
A combined method to investigation of localized deformation processes in notched aluminum alloy as well as carbon fiber reinforced composite specimens is applied in order to reveal characteristic stages of strain and fracture. Stress concentrators have the shape of a circular hole and edge crack of various sizes. Carbon fiber reinforced composites with notches of different size were also tested in order to illustrate the difference in deformation behavior between metal and reinforced polymeric composites specimens. Use of simultaneous strain data registration has allowed us to register and compare parameters under analysis during entire time of the experiments. The reasons of similarity and difference of the results are shown and discussed. It is offered to apply the obtained results for the aims of non-destructive testing of structural materials being based on revealing characteristic stages of strain development and a particularly prefracture stage.

Keywords: strain gauging; digital image correlation; acoustic emission; carbon fiber composite, non-destructive testing.