



Application of metric entropy and DIC for determination of selected parameters of materials subjected to uniaxial tension

Zastosowanie entropii metrycznej oraz cyfrowej korelacji obrazu do wyznaczania wybranych parametrów w materiałach poddawanych jednoosiowemu rozciąganiu

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An application of the typical extensometers during uniaxial tensile tests is the common method used to assess the basic properties of materials. However, this methodology provides only limited data related to the material due to the obvious fact, that the measurements are performed on the specified gauge length, typically located within the central part of the specimen. Moreover, the data captured during the test corresponds to the average value from the gauge length defined, that often does not include a local nature of damage initiation [1].

The paper proposes a combined method for the mechanical properties assessment of composite materials based on the analysis of the internal dynamics of raw data from uniaxial tensile tests. Determination of the Kolmogorov-Sinai (K-S) metric entropy from the recorded data enables to find the tensile strength of materials. A correctness of the methodology proposed was verified by the full field DIC measurements. Therefore, the main aim of this research was to apply an independent measurement tools in analysis of the non-linear dynamics supported by their mutual validation. The experimental program carried out on the glass fibre based thermoplastic Elium acrylic composite and E752 Carbon Fiber Reinforced Epoxy (CFRE) composite [2] confirmed the high suitability of the presented methodology in ultimate tensile stress identification, and thus, its great applicability potential in many aspects of the contemporary engineering.

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References

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