

DIC to evaluate a model composite system cracking due to CTE mismatch

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Coefficient of thermal expansion (CTE) mismatch in composites under temperature variation can lead to the system cracking. In this study, Digital Image Correlation (DIC) was used to investigate this phenomenon in a model composite system (MCS) composed of a single cylindrical inclusion into a ceramic mortar matrix. Temperature variation experiments assisted by DIC were conducted to evaluate the CTE mismatch of the MCS and to observe its cracking. An analytical model was used to fit the experimental radial displacement field of the MCS, which allowed the computation of the inelastic maximum principal strain field, highlighting the radial crack pattern. The crack initiation and propagation were evaluated via damaged elements in the interface region and the computation of the average Mean Crack Opening Displacement and Surface Crack Density for crack regions. This methodology is applicable for a single inclusion MCS, with improvement perspectives for application in multiple inclusions MCS.