On the Use of Digital Volume Correlation for the Identification of the Crushing Behavior of Plaster

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Abstract

Compaction of the core of plasterboard is one of the limiting phenomena for its mechanical performance. This mechanism is studied in a (standardized) nail-pull test and an indentation test. A cylinder made of foamed gypsum is indented in-situ in an X-ray lab tomograph with a nail or a sphere of millimeter radius. The experiments show that foamed plaster displays a sharp transition between an undamaged state (with a linear elastic behavior) and a compacted state with collapsed porosity under the indenter. Tomographic acquisitions of the sample under load associated with a global version of Digital Volume Correlation allow displacement fields to be measured at different load levels. However, because of the heterogeneous nature of the tests, a fine spatial resolution of the displacement fields is required to measure the strains at the crushing limit. A dedicated procedure exploiting computed displacement fields within the digital volume correlation procedure is utilized. It allows for the quantification of stress fields that are post-processed to identify the crushing criterion. It is shown that this analysis is consistent with more macroscopic oedometric and compression tests.

References
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