Adaptative damping structure based on Shape Memory Polymer

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Résumé : *A shape memory polymer (SMP), the tBA/PEGDMA, is elaborated and characterized. The dynamic mechanical characterization of this SMP highlights promising damping properties. The frequency and temperature dependency of the SMP is represented by a viscoelastic model allowing the introduction of the material in the design process of complex structures. A composite sandwich is developed by coupling the SMP with aluminum skins. A finite element model is developed for modeling the behavior of the SMP when integrated in a sandwich structure. The damping performances obtained by the numerical approach are validated experimentally using modal analysis. The experimental results are found to be in good agreement with the predictions of the finite element model. Furthermore, it is found that the controlled heating of the SMP core allows damping the structure over a wide frequency range. The SMP core temperature is tuned from the Time-Temperature Superposition through a rainbow calibration curve to correspond to optimal values of damping ratio in the frequency range of interest ; the ten first modes are dramatically dampt.*

Mots-clés : Shape Memory Polymer, damping control, sandwich structure.