Numerical and theoretical studies of the buckling of shape memory tape spring

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Summary

By using the high froze/recovery strains of shape memory polymers to meet the requirements of deployable space structures, the folding behavior of shape memory tape spring structures consisting of shape memory polymer and metal spring was analyzed. Firstly, numerical simulations were performed on the buckling modes and affecting factors under the equal- and opposite-sense bends. The results show that the folding deformations of such structure in the two cases are completely different. The equal-sense bending leads to the structure buckled abruptly, but gradual torsion buckling is received in the case of opposite-sense bending. The critical bending moments have big difference in the two cases, and the structure response is strongly dependant on the geometric parameters. Secondly, the critical buckling solution under pure bending was derived, and the result confirms to be agreeable with the finite element calculation.