

ADVANCED MATERIALS AND SMART STRUCTURES

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KEYWORDS: shape memory alloy, functionally graded material, FRP, multistable structure

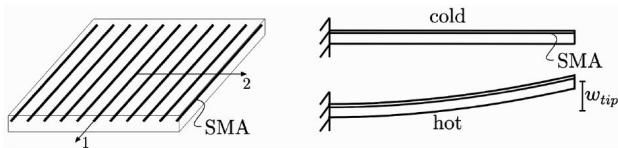


Fig.1 Bending shape control of plates with embedded SMA wires

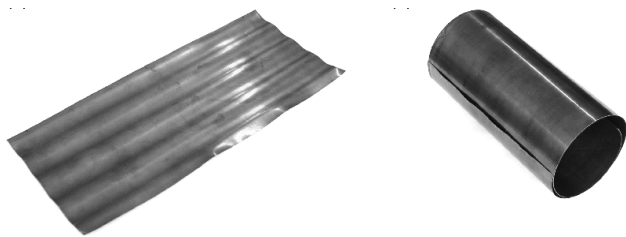


Fig.2 Bistable corrugated plate: straight position and coiled position

The research focuses on advanced ad-hoc developed formulations and numerical analysis for modelling the behaviour of structural components constituted by innovative materials. Recently, a research line on morphing/bistable structures has been started in collaboration with the Department of Engineering of the University of Cambridge. Morphing structures can undergo large changes of shape without plastic deformations giving the potential for large improvement in cost, weight and reliability.

The research touches numerical simulations for the analysis of shape and stiffness control of slender structures using shape memory alloys components. The following topics are under study:

- functionally graded materials (FGM) plates;
- interface behaviour in FRP reinforced structures;
- enhanced strength in FRP wrapped concrete columns. The flexural behaviour of concrete beams cracked and strengthened with fiber reinforced polymers has been studied based on fracture mechanics concepts. The dynamic behaviour has been investigated too, for estimating the variations due to cracking and subsequent strengthening on vibration modes, frequencies and damping;
- bistable structures (corrugated plates);
- finite element approaches for electroelasticity problems;
- finite element approaches for laminated composites.

Links

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MAIN PUBLICATIONS

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RESEARCH PROJECTS

- ❖ Active and passive reinforcements by means of composites for the technologic innovation of the civil structures., PRIN2002 - Bologna Research Unit. Coordinator: Prof. G. Pascale.