

Shape memory alloy based adaptive composite structure for aircraft and automobile.

Minor deflection in structure with conventional technologies requires expensive heavy motors, hydraulics and many moving parts. Nevertheless, using SMA embedded adaptive smart structures, deflection can be easily attained and it is simple in design, light weight, no moving parts and scalable. The ongoing employment of Shape Memory Alloys (SMAs) elements as actuators due to SMA undergo a reversible phase transformation from martensite to austenite as temperature increases. This transformation lead to shape recovery and associate recovery. When a SMA is heated, a solid state phase transformation takes place from martensite to austenite phase which is responsible for shape change or actuation. Due to this phase transformation, the SMA begins to contract and recover its original form even under high applied loads. During cooling, the austenite transforms to martensite and the SMA shape can be changed using bias force as required so instead of providing this bias force from external source, trained SMA wire are combined with composite materials like Glass Fibre Reinforced Polymer(GFRP) material to produce adaptive structure. When adaptive structure is heated with the help of ohmic heating structure will actuated and during cooling due to elasticity of composite material it will back to its original shape without any external power source. In this project SMA wire embedded in the composite with deferent orientation to get end deflection and twisting moment. This adaptive composite structure it will be used in the wing of aircraft for taking right and left turn to save power and give better aerodynamic performance.

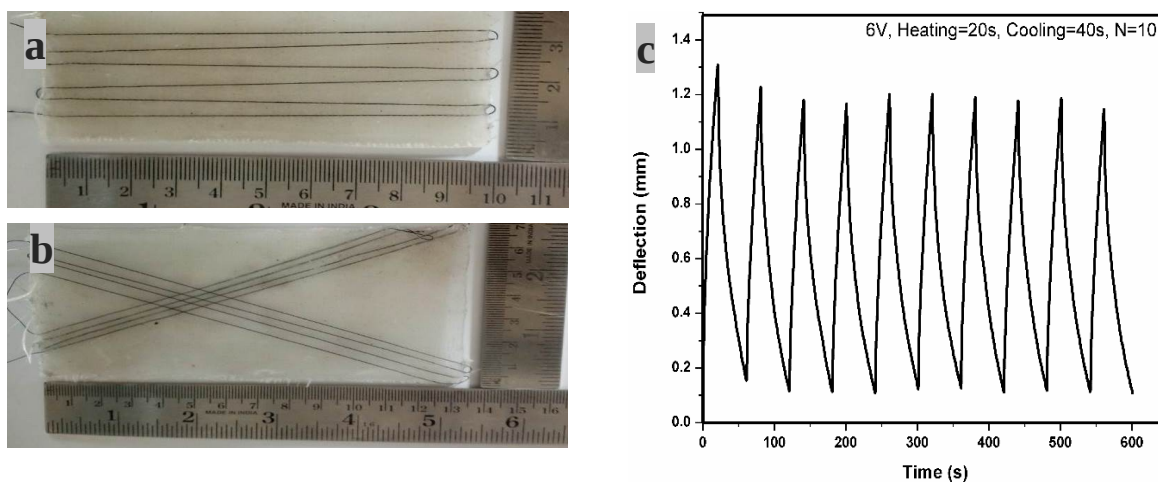


Fig. – a. SMA embedded GFRP Composite structure for end deflection. b. SMA embedded GFRP composite structure for twisting moment. c. Testing of end deflection of composite structure.