



SNS COLLEGE OF ENGINEERING

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Unit - V New Engineering Materials

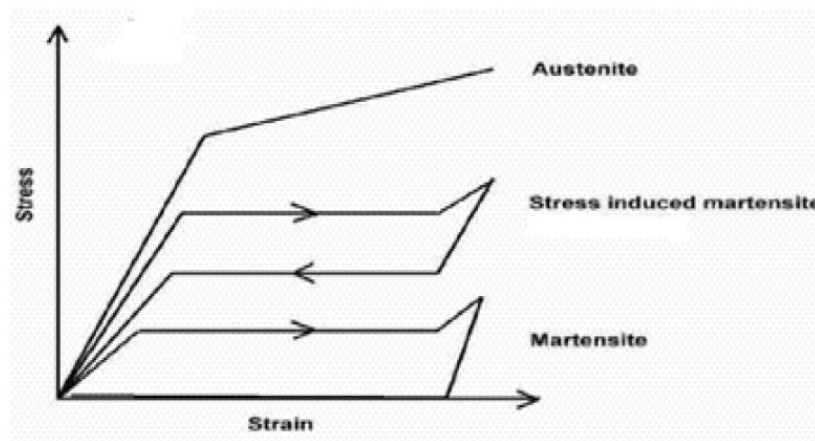
Topic: 9 SMA Ni - Ti Alloy

CHARACTERISTICS OF SMA

(i) Transformation occurs not only at a single temperature rather they occur over a range of temperatures.

(ii) Pseudo elasticity

Pseudo elasticity occurs in some type of SMA in which the change in its shape will occur even without change in its temperature.



Pseudo-elasticity occurs in shape memory alloys when the alloy is completely composed of Austenite. Unlike the shape memory effect, pseudo-elasticity occurs without a change in temperature. The load on the shape memory alloy is increased until the Austenite becomes transformed into Martensite simply due to the loading. The loading is absorbed by the softer Martensite, but as soon as the loading is decreased the Martensite begins to transform back to Austenite.

(iii) Super elasticity

The shape memory alloys which have change in its shape at constant temperature are called super elastic SMAs and that effect is known as super elasticity.

(iv) Hysteresis

The transformation process exhibits the form of Hysteresis curve as shown in figure.

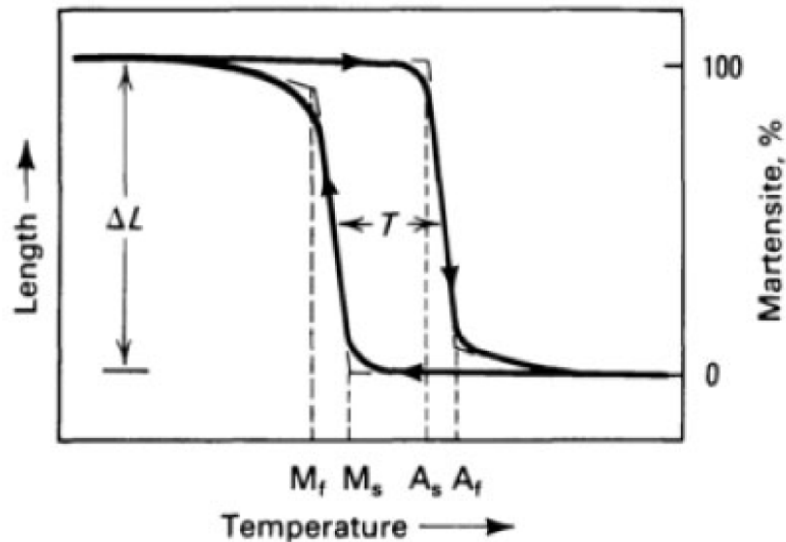


Fig. 1 Typical transformation-versus-temperature curve for a specimen under constant load (stress) as it is cooled and heated. T, transformation hysteresis; Ms, martensite start; Mf, martensite finish; As, austenite start; Af, austenite finish. Source: Ref 1

(v) Crystallographically thermo – elastic martensities are reversible.

TYPES OF SMA

(i) One – way SMA

The SMA remains in the same phase even though there is some change in its temperature, and hence this type of material is called one way shape memory alloy.

(ii) Two – way SMA

The type of materials which produces spontaneous and reversible deformation just upon heating and cooling even without load are called two way shape memory alloys.

PROPERTIES OF NI-TI ALLOY

- Ni-Ti alloy has high shape memory strain
- Density of Ni-Ti alloy is 6.45 gm/cm^3
- Ni-Ti alloy is more flexible
- It has high melting point

- It has high thermal stability
- It has high corrosion resistance
- It has very high yield strength