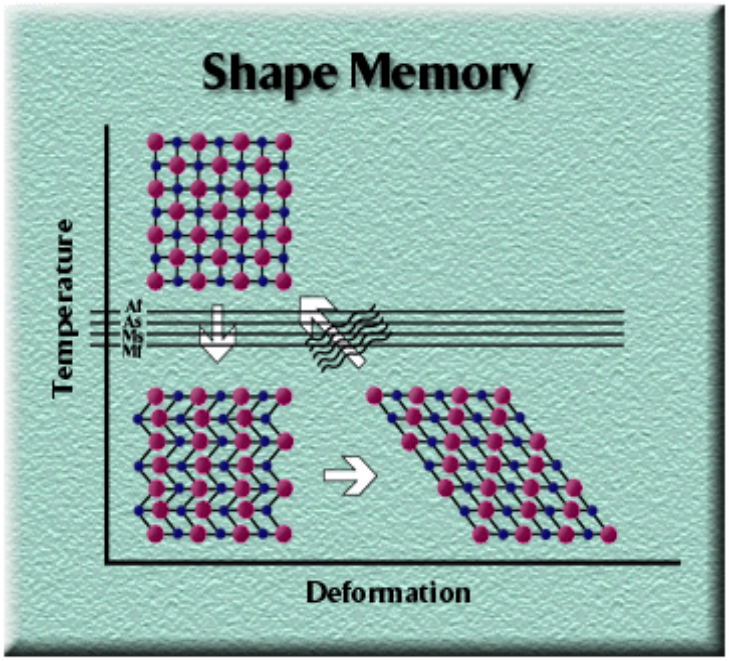
**1- Shape-Memory Effect**

The shape-memory effect (SME) is the unique property that some alloys possess according to which, after being deformed at one temperature, they recover their original shape upon being heated to a second temperature. This is called one – way SME. The ability of shape memory alloys to recover a preset shape upon heating above the transformation temperature and to return to a certain alternate shape upon cooling is known as the two-way shape memory effect. Two-way memory is exceptional.

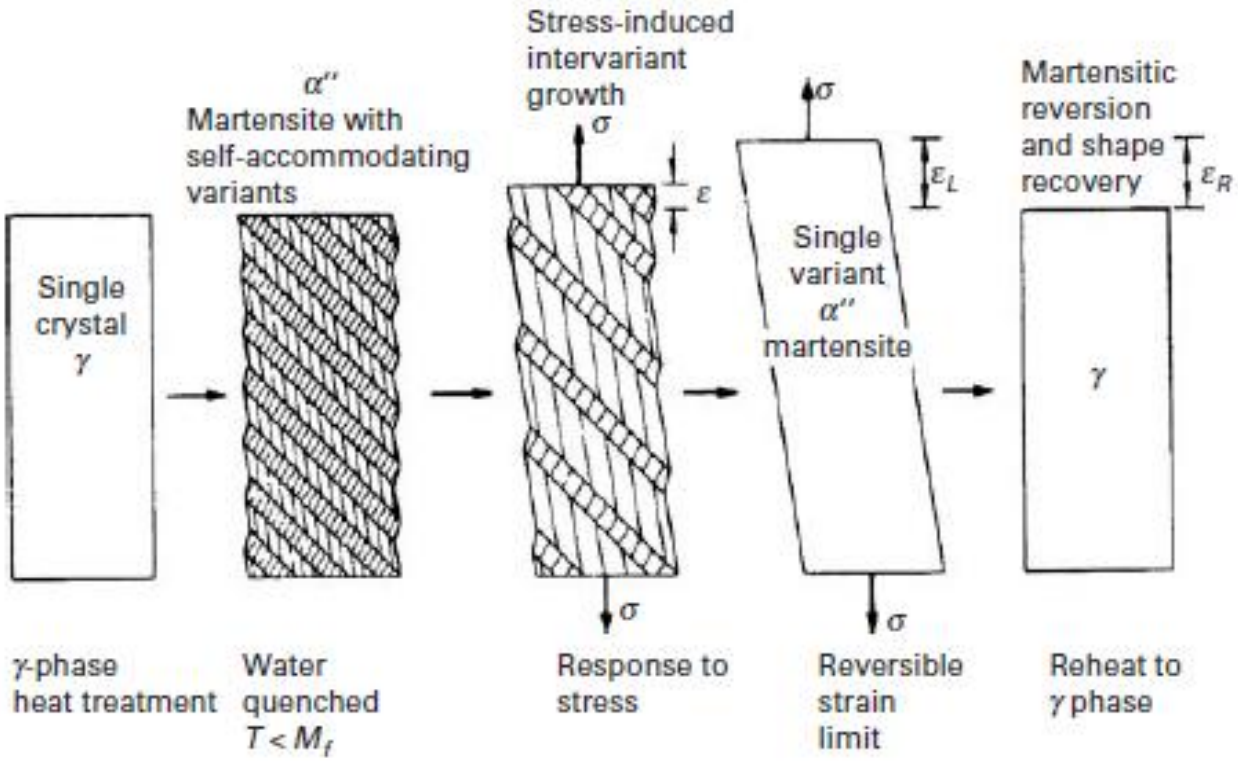
The built-in memory is produced by the martensitic transformation.




Transformation from the austenite to martensite phase and shape memory effect.

In 1951, Chang and Read reported (SME) in an In-Ti alloy.

The SME have been investigated in AgCd, AgZn, AuCd, CuAl, CuZn, FeBe, FePt, NbTi, NiAl NiTi and ternary alloys.



**5- Superelasticity**

Superelasticity (or pseudoelasticity) refers to the ability of an alloy to return to its original shape upon unloading after a substantial deformation.

This is based on stress-induced martensite formation. The application of an outer stress causes martensite to form at a temperature higher than Ms. The macroscopic deformation is accommodated by the formation of martensite. When the stress is released, the martensite transforms back into austenite and the specimen returns to its original shape.

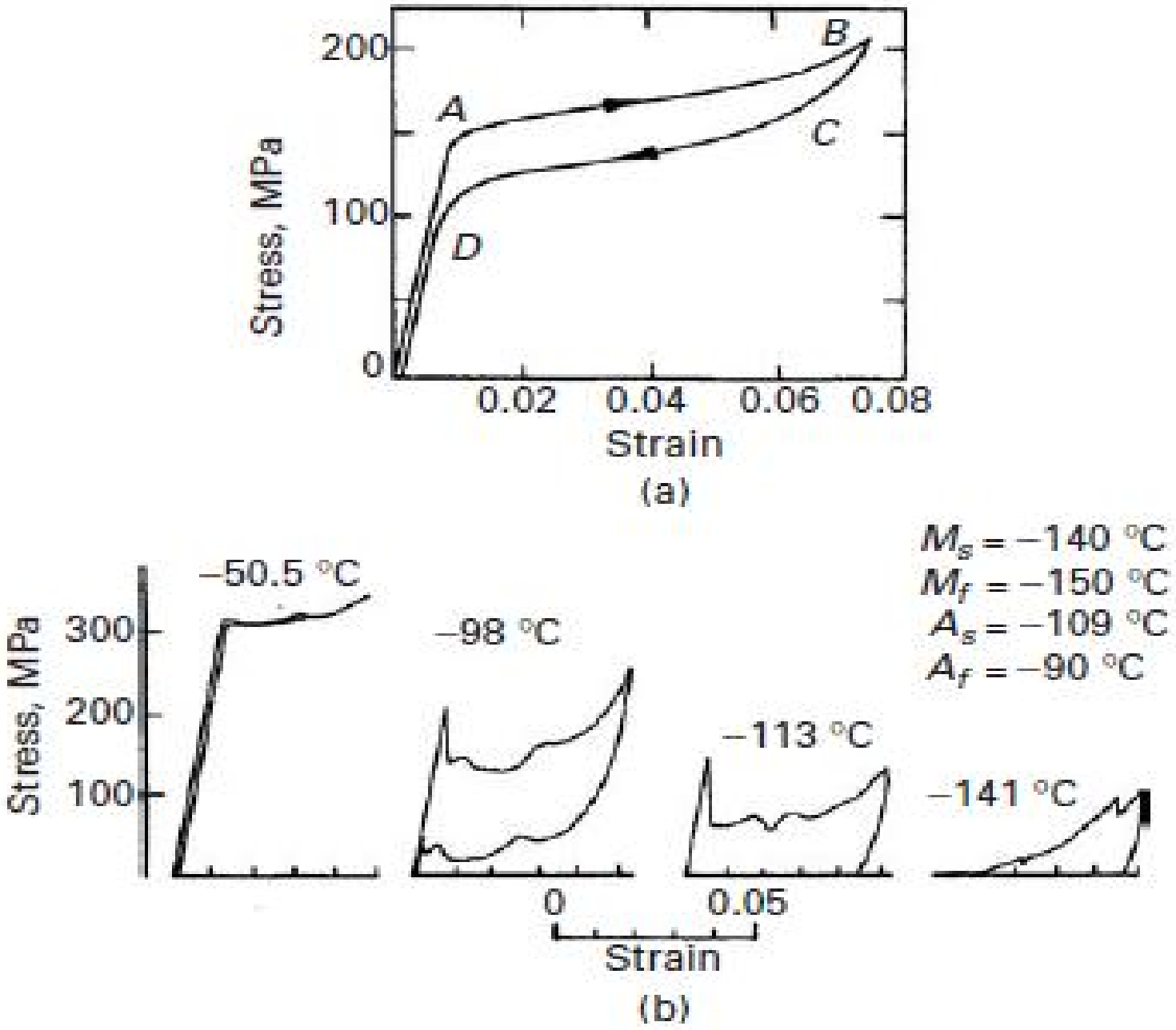



Figure (a) shows the pseudoelastic effect for a Cu--Al--Ni alloy with Ms = −48 ℃. The test was conducted at 24 ℃ (72 ℃above Ms).

At A, stress-induced martensite starts to form.

At B, the martensitic transformation has been completed, and any straining beyond that point will produce irreversible plastic deformation or fracture.

Upon unloading, the martensite reverts to the parent phase between C and D.

Further unloading results in the return to the original length of the specimen.