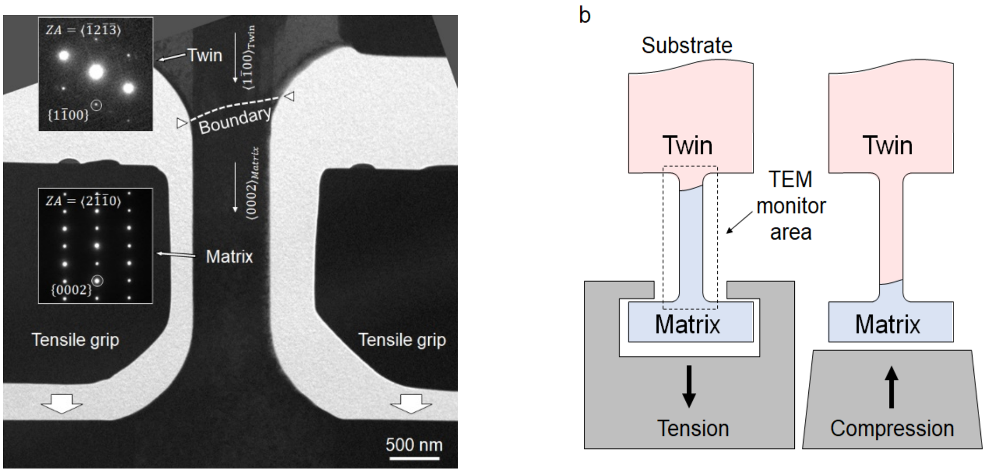
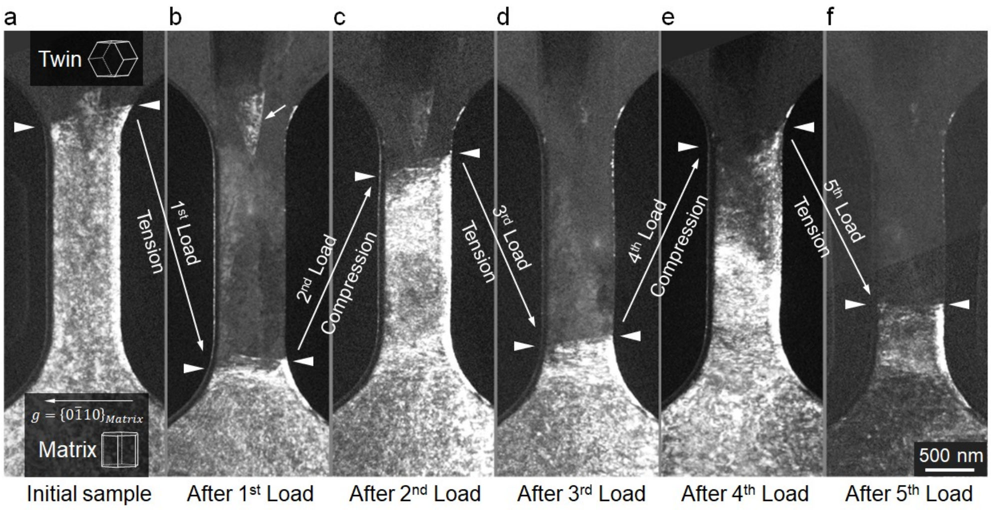
Recent research highlights of Mechanics of Materials group, Department of MEMS, IIT Indore

Hexagonal close packed (HCP) metals (e.g., Mg and its alloys) are considered as replacement of currently used structural metals and alloys (e.g., steels and Al alloys) because of their interesting combination of the physical and mechanical properties. However, their extensive applicability is limited by their yield asymmetry, poor formability, which intimately connected to their fundamental deformation mechanisms. Owing to the lack of five independent slip systems needed for homogeneous deformation, the plastic flow in these materials is controlled by highly heterogeneous deformation twinning (DT). Despite several investigations, the DT mechanism and their role on plastic deformation still seem to be far from incomplete. Recent investigations indicate the TBs in Mg contains several terrace-like features (referred to basal/prismatic (BP) or prismatic/basal (PB) interfaces) and cannot be defined by a definite twin plane. These features may have serious implications on their mobility, migration stresses, anisotropy, and the way they interact with the other microstructural features such as precipitates, slip dislocations, and other twin boundaries. A profound understanding of migration stresses and velocities at different length scales will assist in developing novel Mg alloys with improved mechanical properties. By keeping this in view, we have carried out *in-situ* SEM and TEM deformation experiments to understand the twin mobilities and migration stresses. Our experimental results reveal that the TB structure and defects ahead of it play a vital role in controlling the TB velocity and the migration stresses.





References

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