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Twin boundary: controllable interface to fatigue cracking

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Twin boundaries (TBs) are key factors influencing the mechanical properties of crystalline materials. We have investigated the intrinsic fatigue cracking mechanisms of TBs during the past decade. The effects of TB orientations on the fatigue cracking mechanisms were revealed via cyclic deformation of a series of grown Cu bicrystals with a sole TB. Furthermore, the combined effects of crystallographic orientation and stacking fault energy (SFE) on the fatigue cracking mechanisms were clarified through cyclic deformation of polycrystalline Cu and Cu alloys. Both developments were reviewed in this report which will provide implications to optimize the interfacial design for the improvement of fatigue performance of metallic materials.

Keywords: Fatigue cracking; Twin boundary; Stacking fault energy; Orientation