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Tip-based mechanical force effects on ferroelastic twin structures in epitaxial WO_3 thin films SHINHEE YUN, CHANG-SU WOO, KAIST, GI-YEOP KIM, KIMS, PANKAJ SHARMA, University of New South Wales, JIN-HONG LEE, KANGHYUN CHU, KAIST, JONG HYUN SONG, Chungnam National University, SUNG-YOON CHUNG, KAIST, JAN SEIDEL, University of New South Wales, SI-YOUNG CHOI, KIMS, CHAN-HO YANG, KAIST — A-site vacant perovskite WO_3 structure varies diversely depending on the temperature due to the typical phonon modes softening, which seems to be greatly related with empty A-sites. In addition, this empty structure allows rotations of WO_3 octahedra and distortions of linear W-O-W links instantaneously by external mechanical force. In this context, reorientations of single crystal WO_3 twin domains by pressure have been reported. In this presentation, we report on changes in domain structure and instantaneous piezo-response signal changes in epitaxial WO_3 thin films induced by tip-based shear stresses. For the experiments, we synthesized high quality epitaxial WO_3 thin films on $YAlO_3$ substrates and characterized its crystal structure. The WO_3 films have ferroelastic twin structures consisting of four fold monoclinc building blocks which are subject to cooperative mosaic rotations. Ferroelastic twin structures have hierarchical domains (fine-, macro-, and super-macro-domains) following power law between film thickness and domain width. We also found that the domain structure can be changed by an injection of electron beam.

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