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Dislocation Cross-slip Mechanisms in Aluminum YANG XIANG, Hong Kong University of Science and Technology, CONGMING JIN, Zhejiang Sci-Tech University, China, GANG LU, California State University Northridge — We have systematically studied dislocation cross-slip in Al at zero temperature by atomistic simulations, focusing on the dependence of the transition paths and energy barriers on dislocation length and position. We find that for a short dislocation segment, the cross-slip follows the uniform Fleischer (FL) mechanism. For a longer dislocation segment, we have identified two different cross-slip mechanisms depending on the initial and final positions of the dislocation. If the initial and final positions are symmetric relative to the intersection of the primary and cross-slip planes, the dislocation cross-slips via the Friedel-Escaig (FE) mechanism. However, when the initial and final positions are asymmetric, the dislocation cross-slips via a combination of the FL and FE mechanisms. The leading partial folds over to the cross-slip plane first, forming a stair-rod dislocation at the intersection with which the trailing partial then merges via the FL mechanism. Afterwards, constrictions appear asymmetrically and move away from each other to complete the cross-slip via the FE mechanism.

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